ONLY *ONE* PURPOSE

THE RAIL ANTI-CREEPER

is designed for one purpose only—it's the sure way to prevent Rail Creeping.

THE P & M CO.

CHICAGO • NEW YORK • MONTREAL • PARIS

Springlocks—A NEW HY-CROME PRODUCT

BOLT TENSION—Through research and careful investigation, it has been definitely determined that adequate bolt tension is the answer to tight assemblies, and reduces wear to a minimum. HY-CROME *Springlocks* do this efficiently, and provide that necessary extra pressure through a pre-determined closing load.

REACTIVE RANGE — HY-CROME *Springlocks* automatically and effectively compensate for ultimate wear and looseness — providing and maintaining, through reactive range, a sufficient tension over a wide release height — keeping bolts under constant tension, in spite of wear, is important.

EATON MANUFACTURING COMPANY

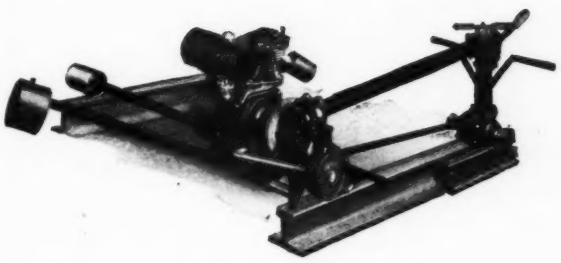
RELIANCE SPRING WASHER DIVISION

MASSILLON, OHIO

Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price: United States and Posessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as secon-class matter January 20, 1933 at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

Raco Power Track Machine



Light, strong, easily handled.

The choice of **50 roads,** including the largest systems, Raco has to have **obvious superiority.**

The original design of the Raco has proved so satisfactory that no major change has been necessary. Parts furnished to-day are interchangeable with all machines in service.

The Raco delivers an exactly uniform power to every nut. The slip clutch is the most reliable known means to accomplish this.

The **most mobile** machine is the **fastest** machine. On out-of-face tightening, **over the long stretches,** the Raco proves its **speed and economy.**

Raco Tie Boring Machine

Bores holes for **screw** spikes or **cut** spikes.

Bores ties in track more than **twice as fast** as any other accepted means.

Bores holes **absolutely vertical.**

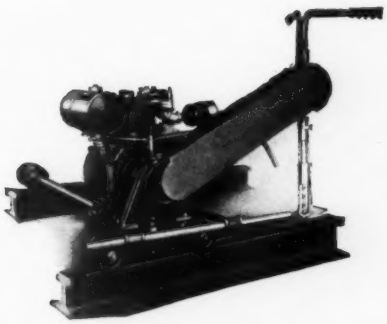
Locates all holes **exactly in center** of tie plate punching.

Automatically **controls depth** of hole.

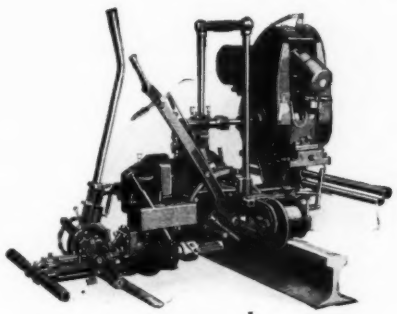
Chips are blown away as fast as made, leaving hole clear.

One-man operation.

Machine can be removed from track by one man.



Everett Power M-W Machine



For ten years the Everett M-W has been the **standard** power rail drill on practically all railroads.

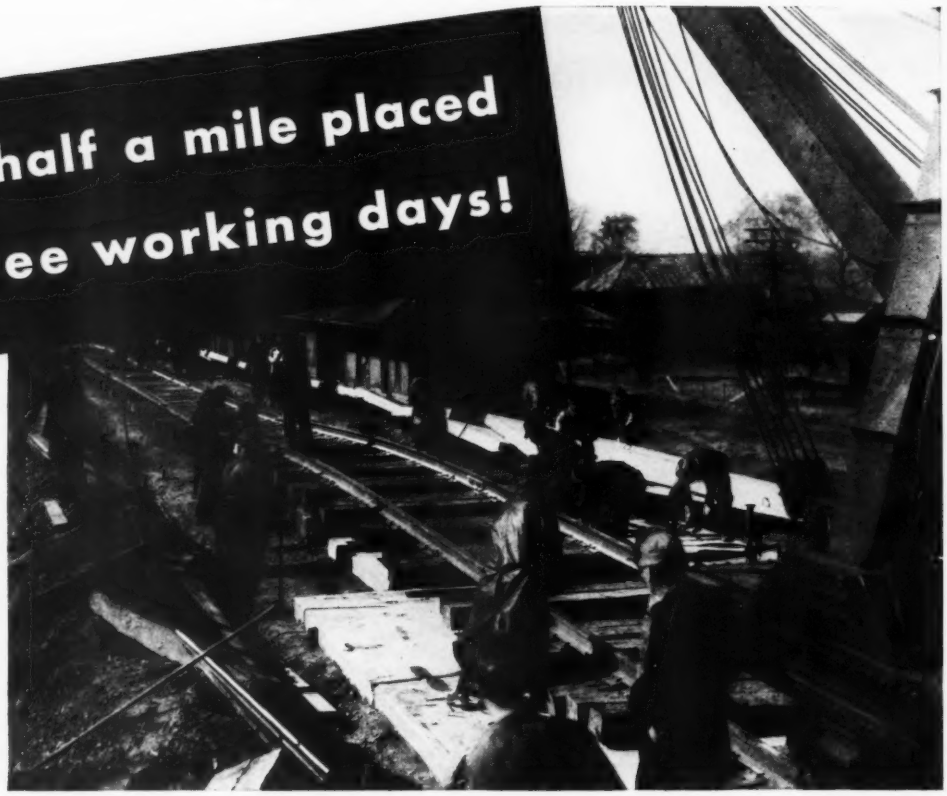
Its design and construction insure the utmost in facility of operation and in speed and accuracy of adjustment.

It has made such astonishing records for economy that **no road can afford to use any other means for drilling bolt holes.**

RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE
405 LEXINGTON AVENUE
(Chrysler Building)
NEW YORK

Over half a mile placed in three working days!



While track gang jacked up track and dressed the sub-grade, crane crew slid slabs up to rail, unhooked the cables, rehooked and moved slabs to final position.

Illinois Central stabilizes a trouble-spot with CONCRETE SUPPORTED TRACK

NOVEL METHODS OF FORMING SLABS USED. Standard highway construction methods were used. A stretch of ground beside the track was graded and rolled, as for a highway . . . surface covered with roofing paper . . . side forms and separators pinned in place . . . reinforcement placed and slab cast. Finished slabs were hoisted onto freight cars and distributed along right of way beside the job.

THE west approach to the Illinois Central bridge at Vicksburg lies on a gumbo and river silt fill 30 ft. high at the abutment. Water pockets made proper maintenance expensive. So concrete sub-ballast slabs were chosen as the most economical means of stabilizing the track and forestalling high maintenance.

The job involved 1,526 ft. of tangent track and 1,135 ft. on a 4-degree curve. Despite the necessity of frequent clearing for traffic, the road gang and crane crew placed the 2,661 ft. of slab in 3 working days . . . placed 22 slabs in one hour . . . completed 1,000 ft. by 3:30 p. m. the last day! And the job is done for *keeps*.

You can lick high maintenance at bad spots with Concrete Supported Track. It bridges sub-grade weakness and distributes the load over wide areas; provides practically uniform support at all seasons, over all soils; simplifies drainage problems and resists frost damage.

Write for technical booklet, "*Concrete Supported Railway Track.*"

PORTLAND CEMENT ASSOCIATION
Dept. A7-27, 33 West Grand Avenue Chicago, Ill.
A National Organization to Improve and Extend the Uses of Concrete

STREAMLINE YOUR ROADBED WITH CONCRETE TRACK SUPPORT

Years Ahead in Design

FAIRMONT CARS HAVE THE FEATURES WHICH SERVE YOU BEST

Performance ON THE JOB COUNTS

Fairmont MODERN LIGHT-WEIGHT CONSTRUCTION

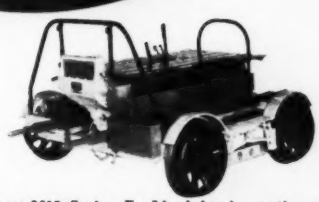
Increases Car Safety Reduces Costs

Fairmont long ago took the lead in improving the design of motor cars, lightening the weight without sacrificing strength or dependability.

Fairmont originated double extension lift handles to provide the extra leverage necessary for easy removal of cars from tracks. In collaboration with metallurgists, Fairmont pioneered the application of special alloys and specially designed parts combining great strength with light weight. In each Fairmont model operating in inspection and light section work, the use of aluminum alloy and alloy steel in the frame, body and engine reduces dead load to the minimum. Plymetal in tool trays further lessens car weight.

The Fairmont advanced design, employing the use of specially fabricated alloy steel or aluminum section in cross members and sills of the frame further reduces weight and contributes to better balance.

The lighter weight of Fairmont cars brings, with easier handling and greater safety, more power at lower fuel cost and more flexible riding comfort for the operator. Fairmont Railway Motors, Inc., Fairmont, Minn.



Fairmont M19 Series E. Ideal for inspection service. This spring-mounted aluminum frame car carries 4 men yet can be easily removed from the track by one man. Extension lift handles reduce the rear lift to 95 lbs. New Fairmont 5 to 8 H.P. Hy-load roller bearing engine. Ask for bulletin 396.

Fairmont M9 Series D. Another popular spring mounted aluminum frame car with rear lift of only 95 lbs. Holds 2 men. Safe for one. Fairmont Hy-load 5 to 8 H.P. roller bearing engine. For details see bulletin 391.

Fairmont M14 Series D. "Alcoa" heat-treated aluminum alloy channels in the main frame members and engine sills have the tensile strength of steel but weigh 110 lbs. less and contribute to the easy handling of this powerful 6 man section car. The rear

F ALL THE CARS IN SERVICE TODAY

More Than Half are Fairmonts

Quick Removal of SPIKES

Three Nordberg Spike Pullers and nine men lead this typically large rail laying gang on the Milwaukee Road.

To maintain speed for the other operations which follow in the rail laying gang, spikes must be pulled quickly. The Nordberg Spike Puller increases the efficiency per man engaged in spike removal 1500 per cent. This machine eliminates what is often the "bottle neck" of the job and especially when spikes are hard to pull. It pulls without bending and easily gets spikes which can not be pulled with claw bars. For removing spikes between guard rails and on trestles and bridges, it is just as fast as on open track. Bent, headless and "cutthroat" spikes make no difference to the Nordberg Spike Puller. Three men and the machine will easily pull from 35 to 45 spikes per minute. For speed and lower rail laying costs, put Nordberg Spike Pullers at the head of your rail laying gangs.

NORDBERG POWER TOOLS FOR TRACK MAINTENANCE

Spike Puller
Track Wrench
Utility Grinder
Precision Grinder
Adzing Machine
Power Jack
Rail Grinder
Rail Drill
Track Shifter

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

Put in Bethlehem Track Fastenings—then . . .

Watch the wheels ROLL BY

Watch the hammering given rail joints by wheels on today's high-speed trains. That's good indication that the strength and tenacity of Bethlehem Heat-treated Bolts and Hot-forged Nuts are required to keep joints tight.

Bethlehem Track Fastenings hold rails to rigid, accurate alignment. The rail joint assembly is tight. End batter and low joints are kept at the minimum. Maintenance costs are materially reduced.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

CUTTING CORNERS ON COSTS

Left and below: One of 3 International T-35 TracTracTors recently purchased by the Atchison, Topeka and Santa Fe Railway for the engineering maintenance of way department. These pictures were taken near Amarillo, Texas, while this unit was powering a compressor built on the rear end to operate a battery of hammers for driving spikes, tamping ballast, etc. These Internationals are called on to do a variety of work.

ECONOMY of International Industrial Tractors is proved in the rapidly growing demand for them by men who have had experience with a variety of tractor power. The example shown here is only one of the diversified applications of these tractors. The call for International's economy, efficiency, and dependability increases every day.

International Tractors are available in crawler and wheel types. There are six TracTracTors (gasoline and Diesel), including the new 70 h.p. TD-18 Diesel; and five wheel tractors (gasoline and Diesel). In this wide variety, you will find the tractor to fit your jobs. See the nearby International industrial power dealer or Company-owned branch for detailed information.

INTERNATIONAL HARVESTER COMPANY
(Incorporated)
180 North Michigan Avenue Chicago, Illinois

INTERNATIONAL Industrial Power

1. Alternate layers of Koppers Old Style Coal Tar Pitch and Koppers Tarred Felt are applied to the roof to form a waterproof, weather-resistant membrane.

KEEP OUT WATER WITH KOPPERS COAL TAR ROOFING*

2. Close inspection by Koppers men at every stage of the construction of a bonded roof assures a finished roof that is exactly up to the specifications.

3. A final heavy pouring of Koppers Coal Tar Pitch covers the entire roof Then a layer of gravel or slag is spread to protect the roof from surface wear.

FOR NEW CONSTRUCTION

Koppers Coal Tar Pitch Roofs on your new buildings can be bonded for 10, 15 or 20 years of maintenance-free service. Coal tar pitch and felt roofs have served much longer than that. Koppers Roofs now serving industry in many sections of the country have proved their ability to stand up under all climatic conditions.

FOR RE-ROOFING

Fix up that leaking roof once and for all, with a Koppers Roof of Coal Tar Pitch and Tarred Felt. Coal Tar Pitch resists the action of water and sunshine, which ruins many roofs. It has the ability to "self-heal" seasonal surface breaks. These two qualities make Coal Tar Pitch the safest roofing.

KEEP OUT WATER WITH KOPPERS WATERPROOFING

Koppers Waterproofing being applied around the base of an underpass. This will exclude moisture.

To Keep Water Out of: Basements, Tunnels, Shafts, Storage Pits.

To Keep Water In: Reservoirs, Concrete or Masonry Storage Tanks, Basins.

To Eliminate Seepage: Bridge Decks, Masonry Standpipes, Substructures, Foundation Walls.

To Protect Concrete and Masonry from Disintegration: Foundations, Abutments, Retaining Walls, Culverts, Sumps, Vats.

To Prevent Corrosion of Steel: Beams, Reinforcing Steel in Concrete.

To Seal Against Termites: Floor and Foundation Joints.

Write for a copy of "Koppers Specifications."

OTHER KOPPERS PRODUCTS: Damp-Resisting Paints . . . Bituminous-base Paints . . . Tarmac Road Tars for paving drives, parking areas, walks, etc. . . . Pressure-treated Piling and Other Timber Products . . . Platework . . . Tanks . . . Pipe . . . Gas, Air, and Water Valves . . . Coal . . . Coke

KOPPERS COMPANY • PITTSBURGH, PA.

Save 30% ON TIE RENEWALS

- Speeds up Renewals
- Eliminates Trenching
- Preserves Solidarity of Roadbed
- Light Weight—Can Be Removed from Track by its Operator in 10 Seconds
- Cuts Costs 30% or More and makes the Work Easier

WOOLERY TIE CUTTER

saves more than 12 cents on every tie and normally pays for itself in 30 to 60 days . . . a fact verified by service records, the most recent of which is an extensive cost study made by one railroad in its renewal program this season. This study involves 32 Woolery machines and the replacement of approximately 400,000 ties, at a saving of more than $48,000.

The Woolery Tie Cutter is the *most* outstanding development that has ever been made to simplify and cut the cost of tie renewals . . . It will pay you to investigate.

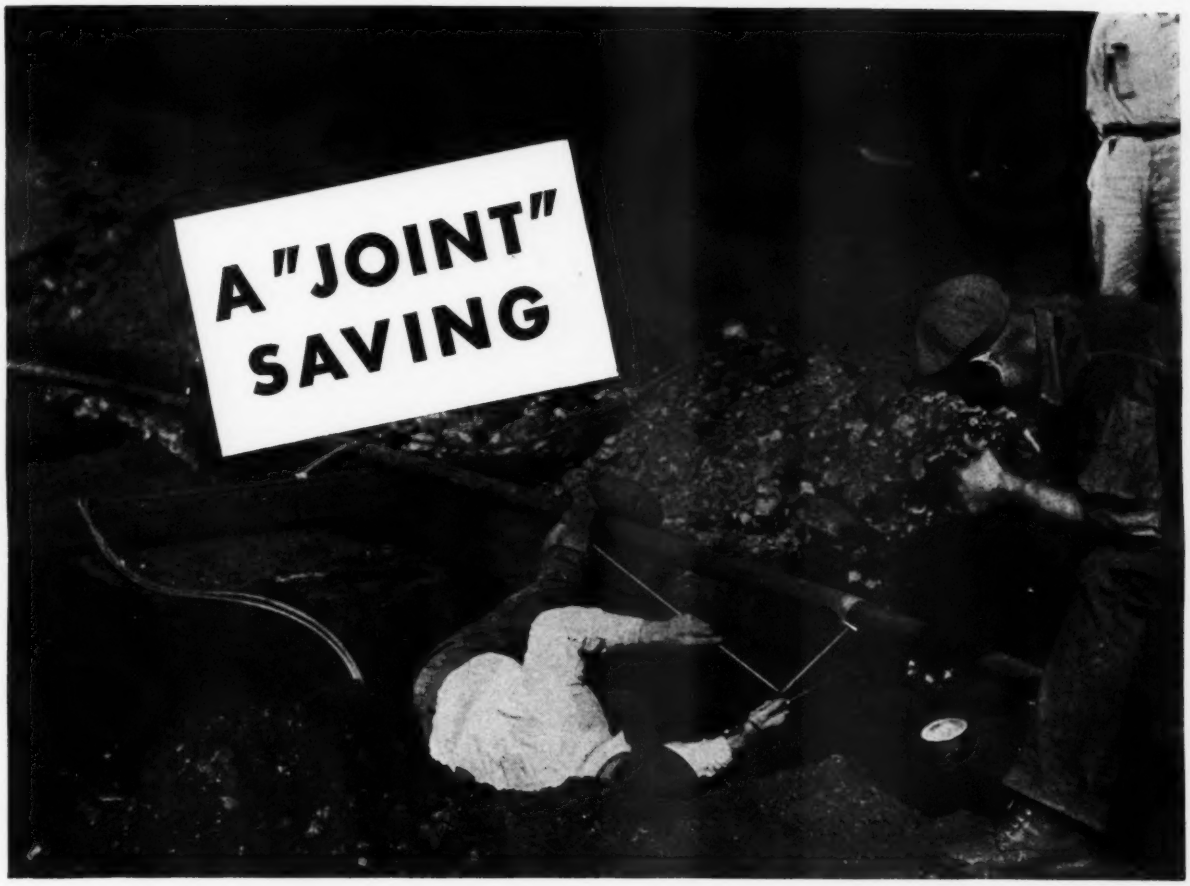
We will gladly arrange a demonstration on YOUR road. Write for the 12-page booklet which fully describes and illustrates this great money saver.

WOOLERY MACHINE COMPANY
MINNEAPOLIS MINNESOTA

Pioneer Manufacturers of
RAILWAY WEED BURNERS · MOTOR CARS
BOLT TIGHTENERS · TIE SCORERS · HEAVY
DUTY WORK CARS · TIE CUTTERS . . . .

WOOLERY MINNEAPOLIS

RAILWAY MAINTENANCE EQUIPMENT

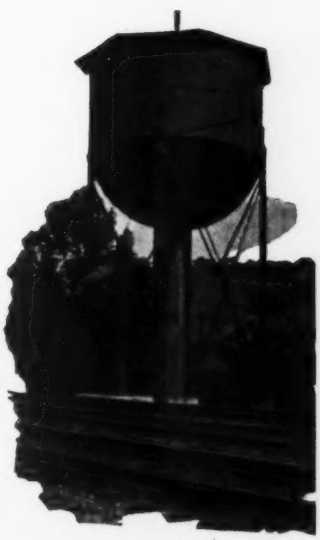


...in maintenance and installation costs

A joint that has been made by the **AIRCOWELD** process is economical, both in elimination of future maintenance cost and in initial installation cost.

AIRCOWELDING is the process that has been specially developed for joining of pipe in a *permanent, leak-proof joint* that can be buried and forgotten. In addition, the **AIRCOWELD** process cuts welding time in half—with a resultant saving of from 30 to 50% in rods and gases and a material reduction in labor costs. For economical, trouble-free installation of water service piping, investigate this fast, economical process.

Our engineers' experience is at the service of **AIRCO's** railroad customers for any problem such as: oxyacetylene rail end cropping, building up rail ends, hard surfacing, flame cutting locomotive and car parts, or any other service in which **AIRCO** methods can be of help to you. Do not hesitate to call us.



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GENERAL OFFICES: 60 EAST 42nd ST., NEW YORK, N. Y.

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AIRCO

● SERVING RAILROADS FROM COAST TO COAST ●

No. 127 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Better Railroading

July 1, 1939

Dear Reader:

When conversing with the chief maintenance officers of three of our largest railways a few days ago, I was struck with the interest that they displayed in a new machine for use in track maintenance which none of them had ever seen but which has been advertised in this magazine of late. This struck me as such an excellent illustration of the constructive functioning of your magazine in providing a medium for a manufacturer with a limited sales organization to bring to your attention new developments from distant areas that I desire to develop this thought a little further with you.

Have you ever considered the extent to which the dissemination of such information regarding the availability of new materials, new devices or new machines has contributed to the increase in efficiency with which you are conducting your operations today? Have you looked back over your methods and practices of 20 or even 10 years ago and noted the changes that have taken place? How many of them have originated on your own road? In contrast, how many have been developed elsewhere and been brought to your attention? I am sure that you will concede that you owe much to others.

Conceding this much, how did these developments come to your attention? Did they come by word of mouth? Undoubtedly, you learned of some of them in this way. But, unless you are so located that manufacturers' representatives can call on you readily or you are so situated that you can travel widely and converse with many people, and few railway officers are able to do this in these days of reduced staffs and heavy responsibilities, you have learned of these developments through their presentation in our pages.

This is the function of Railway Engineering and Maintenance—to stimulate an increase in the efficiency with which maintenance of way operations are conducted by providing the medium through which manufacturers can bring their developments to your attention—months and possibly years ahead of the time when they would come before you through other channels.

Yours sincerely,

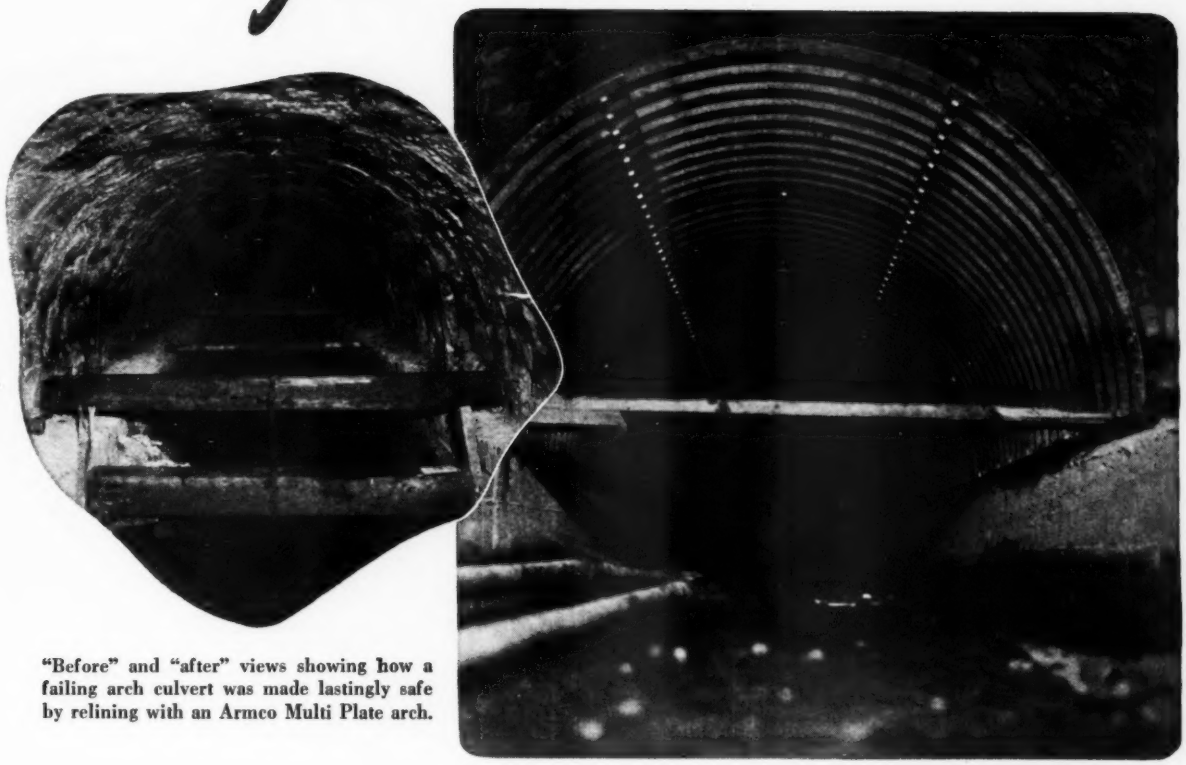
Elmer T. Howson

ETH:EW

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

END THE WORRY OF "Falling Arches"



"Before" and "after" views showing how a failing arch culvert was made lastingly safe by relining with an Armco Multi Plate arch.

Many of the old arch culverts under your tracks have probably been weakened by the constant impact of heavy traffic. By relining these unsafe structures *now* with Armco Multi Plate you can avoid the cost of complete replacement, preserve virtually all the original waterway area, and finish the work without interrupting traffic.

Your regular maintenance crew can assemble Multi Plate arches quickly and economically despite bad weather. The heavy-gage corrugated iron plates are easily bolted together inside the existing structure. No power equipment is needed and, since the roadbed is not disturbed, train schedules can be maintained at normal speeds without costly slow orders.

Field inspections prove that Armco Multi Plate provides ample structural strength to meet standard railroad loading specifications with a wide margin of safety. Moreover, you can depend on Multi Plate arches to serve for years without attention because they are made from galvanized ARMCO Ingot Iron plates in thicknesses up to 9/32-inch.

Call or write our nearest office for complete information. Ingot Iron Railway Products Co., (Member of The Armco Culvert Manufacturers Assn.) Middletown, Ohio; Berkeley, California; Salt Lake City, Philadelphia, Dallas, Atlanta, Minneapolis, Denver, Los Angeles, St. Louis, Portland, Cleveland, Chicago, Spokane, Richmond, Virginia; and Houston, Texas.

MULTI ARMCO PLATE

ARMCO MULTI PLATE

A Product Originated and Developed by Armco Engineers

You Can HAVE BETTER TRACK AT LOWER COST

BARCO UNIT TYTAMPERS do a BETTER JOB *Quicker*

IN OUT OF FACE or SPOT TAMPING

Each Unit is Self-Contained and Easily Carried by ONE MAN No Auxiliary Equipment is Needed

BARCO provides the most flexible, convenient, and efficient method of maintaining thoroughly tamped track.

BARCO MFG. COMPANY

1805 W. Winnemac Ave. Chicago, Ill.

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The HOLDEN CO., LTD. Montreal-Moncton-Toronto-Winnipeg-Vancouver

Now 47 RAILROADS Use Barco 4 YEARS SATISFACTORY RECORD

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JULY, 1939

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JOHN S. VREELAND
Associate Editor

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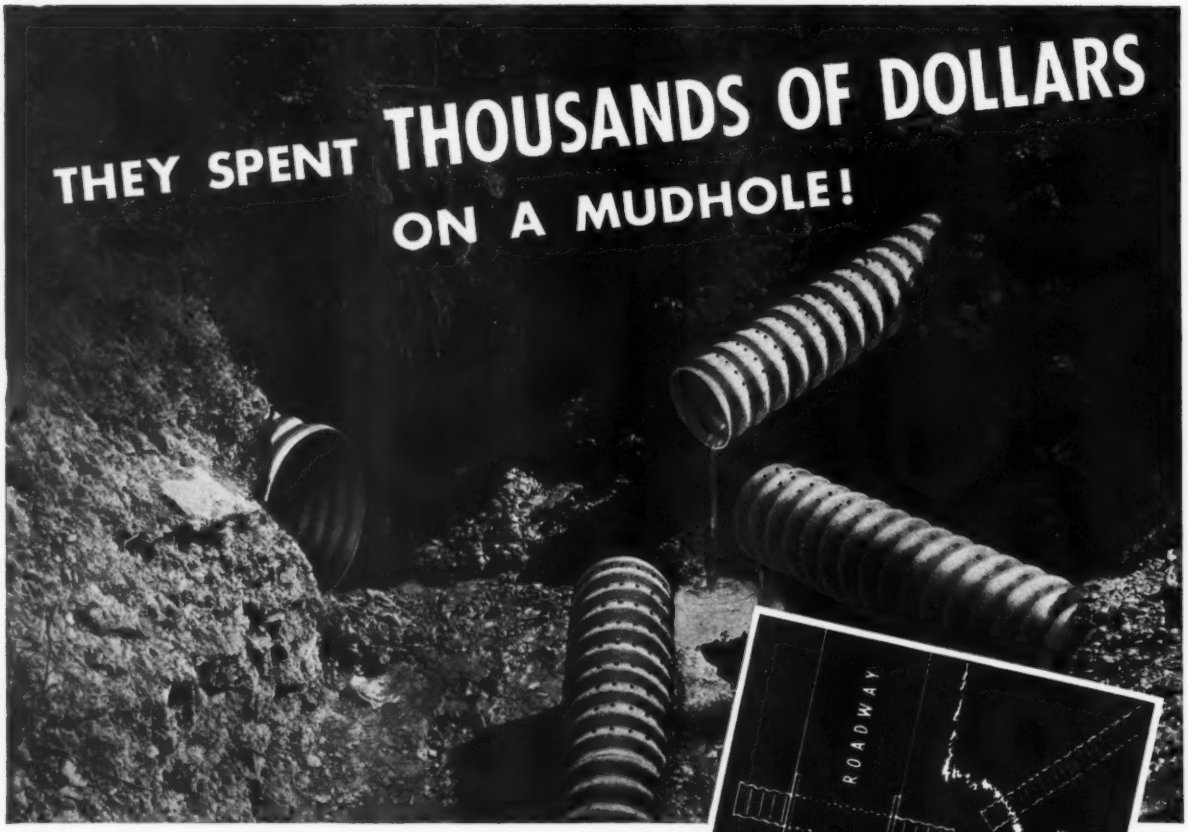
THEY SPENT THOUSANDS OF DOLLARS ON A MUDHOLE!



— then cured the SORE SPOT with Perforated Steel Culverts

THIS wet hillside was a continual source of trouble, causing a soft roadbed and intermittent slides. Thousands of dollars had been spent in repairs and maintenance work without lasting success. Then they installed three lines of U·S·S Perforated Culverts extending up the hill like a chicken foot and draining into a fourth culvert through the roadbed. This economical installation solved the drainage problem without further trouble.

Perforated culverts made of U·S·S Galvanized Copper Steel often prevent slides, sunken roadbeds, soft spots in places where seepage is difficult to control. And the cost is small compared to cost of making road repairs.

A large majority of road maintenance jobs can be traced to inadequate drainage. Many of them could be prevented if more culverts were used in the first place. The low cost of galvanized culverts of U·S·S Copper Steel makes it possible to furnish better drainage without running up the cost of the job.

You can get corrugated culverts of U·S·S Copper Steel from our culvert manufacturer in your vicinity. We'll gladly furnish names on request. Write to any of the companies below.

Look for this symbol when you buy culverts. It represents the highest quality and the finest workmanship.

COPPER STEEL CULVERT SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

Scully Steel Products Company, Chicago, *Warehouse Distributors* · United States Steel Products Co., New York, *Export Distributors*

UNITED STATES STEEL

Railway Engineering and Maintenance

Losses

When a Railway Leaves a Community

A FEW months ago the Central of Georgia Railroad received authority from the Interstate Commerce Commission to take up a 47½-mile branch line in Georgia. This abandonment will be beneficial to the railway, for this line has long been unprofitable, having failed to earn even its out-of-pocket operating expenses for some time. Discontinuance of operation will, therefore, eliminate a drain on the revenues of the remainder of the property.

How About the Public?

From the standpoint of the public, the effect will be different. Ten communities along this line have long enjoyed regular daily freight and passenger service; they will have this no longer. Only two of these communities have other railroads; eight will now be forced to depend upon other forms of transportation.

This line crossed four counties, one for only a short distance. The other three counties will lose one of their largest, if not the largest, single source of tax revenue. The Central of Georgia has paid more than $15,000 taxes annually on this line, of which some $6,000 has gone for the support of schools. These taxes will no longer be paid and the counties will be forced either to curtail operations or to find other sources of revenue.

The abandonment of this line will also affect railway employees adversely. While the railroad had already reduced expenses on this line to the minimum, 17 positions were abolished when operation was suspended. These men were residents of the communities along the line and numbered among their better citizens. Their wages were spent with the merchants of these towns. Their taxes averaged well up with those of other citizens of these communities. The abandonment of this line deprived these employees of their livelihood. It also deprived these communities of their earnings.

11 States Without Railways

What has happened to this line in Georgia is in prospect on 140 miles of Q. O. & K. C. line in Northern Missouri. It is happening to railways throughout the country. No area is immune.

Within the last 22 years, more than 22,000 miles of lines have been abandoned—a mileage greater than that contained in the states of Maine, Vermont, New Hampshire, Rhode Island, Massachusetts, New York, Connecticut, New Jersey, Delaware and Maryland, with Wyoming thrown in for good measure. To deprive an area as large as these 11 states of railway transportation is unthinkable, for it would mean the ruin of the cities and farms included therein and force the migration of a large part of its people to other areas. Yet this is what is occurring piecemeal throughout the country, with results equally disastrous to hundreds of communities.

A railway turns to abandonment only as the last resort, after every other means of keeping the line in operation has failed. An abandonment in these days is seldom due to the drying up of the territory the line serves. In nearly all cases it is due, as in the cases of the Central of Georgia and of the Q. O. & K. C., to the use of other forms of transportation by those who had formerly given their patronage to the railways. The community that abandons its railroad by giving its patronage to the competitor of the railroad can expect the ultimate abandonment of that railway's line as a direct result of its actions.

What Can Employees Do?

Of what concern is this to the railway employee? The answer is self-evident. It is direct and vital, for his very livelihood is at stake. He cannot turn at will to another position, for he has given the best years of his life to training for highly specialized service.

To the maintenance of way man, the loss is especially great, for, while standards are lowered, tracks and structures must be maintained to permit the last train to pass safely. As a result, the maintenance man is the last to leave. When one considers the number of track men who have already lost their employment through the abandonment of more than 22,000 miles of line, even though they may have been of the lowest standards of upkeep, and adds to these the bridge and building men, their supervisory officers, the accountants who audit their records, etc., the effect on railway employment becomes very real.

Of what concern is such a situation to the communities, large and small, that are diverting their shipments to other transportation agencies, principally the highways? Do they realize that every time they patronize the trucks and the buses, they are by this action promoting the abandonment of rail service through their communities, with all that this means in less dependable and more expensive transportation service—in reduced property values and increased tax burdens—in reduced payrolls,

both directly and indirectly? In general, they give little thought to this effect, direct though it is to those who stop to consider the facts.

The problem is to bring these facts to their attention. This is the responsibility of railway employees—those who have most at stake. They can render no greater service to the perpetuation of their industry, aside from the efficient performance of their normal duties, than to acquaint those with whom they come in contact in their communities with the importance of efficient transportation to the life of these communities and to the necessity for these communities to give the railways their patronage if they desire to perpetuate the service which is so vital to their continued existence.

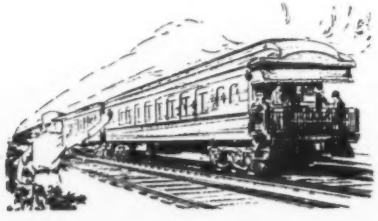
Low Spots

Can They Be Avoided at Bridge Ends?

PROBABLY no equal length of track is the subject of so much criticism with respect to riding qualities as that at the ends of bridges. That low spots at these points are not confined to a few special localities or to certain lines, but are widespread, is attested by the fact that they are found on railways that are maintained to high standard, as well as on those having lower standards of maintenance. Some trackmen take the view that they are more or less of a necessary evil, and that the best that can be done is to watch the bridge ends, surfacing, leveling and lining the track when necessary, but letting it go at that. Obviously, this is not a constructive attitude, and generally results in the bridge ends being low most of the time, because the section forces tend to neglect them when other work presses.

Low spots at the ends of bridges may result from several causes, the most common of which is lack of support for the ballast section by reason of narrow shoulders on the roadbed, bulkheads at timber trestles that are too shallow or too short, failure to extend the embankment far enough ahead of the first bent, backwalls that are too short, or skimping on the height and length of wing walls. Sometimes these causes first become apparent after a ballasting program, under which the bridge itself has been raised but the timber bulkheads, masonry or roadbed shoulders have not been extended correspondingly.

These defects, whether they existed originally or resulted from later change of grade, are susceptible of correction, rarely presenting any inherent difficulty. Except for widening the roadbed, the section foreman is unable to apply corrective measures with his own forces. On the other hand, it is within the power of the supervisor and division engineer to do so, or at least to arrange for correction. If they do not do this, they cannot shift the responsibility for the condition to the shoulders of others.



Next in importance, and including most of the remaining cases, is inadequate drainage or lack of drainage. This may result from faulty design of the masonry, the placing of unsuitable material back of abutments or failure to provide drainage when needed. Where there is a gradient toward the bridge, water is likely to collect behind the upper abutment, a condition that calls for adequate provision for collection and drainage. Joints close to bridge ends sometimes make it difficult to keep the track in good surface, and this should be given special attention when rail is being laid. If all of these faults of design and construction have been eliminated, the low spots then become the direct responsibility of the section forces.

It should not be overlooked, however, that the point where the wheels pass from the somewhat yielding support of the roadbed to the rigidly supported track on the bridge, or vice versa, is one where small irregularities in line and surface are magnified with respect to riding discomfort. It thus becomes important that even under the most favorable conditions special attention must be given to the track at the ends of bridges, and that unfavorable conditions be corrected to conserve the time of the section forces and assure smooth riding.

Sliding Cuts

Present Major Problem in Maintenance

WHEREVER sliding cuts occur they present a major problem to track maintenance forces, partly by reason of the volume of earth involved in the movement, although in some cases this may be relatively small, and partly because inadequate or defective drainage lies at the seat of the trouble. In some cases the movement is of sufficient magnitude to overflow the track and interfere with trains; in others, a combination of saturated strata in the roadbed and shifting load may disturb the alinement and surface of the track, endangering trains; in still others, the flowing or sliding material may not reach the track, yet be severely troublesome by blocking surface drainage in the cut.

While all sliding cuts have a common cause, inadequate drainage, they vary widely in almost every other particular, and the methods necessary for their correction vary almost as widely. In fact, experience has shown that a plan of correction that has been entirely successful in one case may be the reverse in another. Obviously, the most important element in any plan to stabilize sliding material is drainage, for dry earth is seldom mobile. Where sufficient drainage can be installed, a slide can usually be brought under control without any further action; yet it is an unfortunate fact that control through drainage alone is seldom practicable.

In some cases, surface drainage to intercept the water before it can reach the sliding material may effect a cure; in others, subsurface drainage may also be required before satisfactory results can be obtained; in still others, drainage may be physically possible but so expensive as to be prohibitive. In a few cases, provision for drainage at or near the foot of the slide will be beneficial. There are many cases where an elaborate system of surface and

subsurface drainage will be a paying investment, provided it can be installed at a cost within reason. It should not be overlooked, however, that the material comprising the slide may be of such a character that it will absorb water readily but give it up reluctantly, in which event the drainage system may be less effective than expected.

In some instances, the most practicable plan will be to drive a pile bulkhead or to construct a retaining wall, preferably of heavy field stone, at the toe of the slope. This can sometimes be made high enough to flatten the slope approximately to the angle of repose. Such a barrier should have ample provision for drainage through it; otherwise the trouble may be aggravated rather than improved.

Sometimes none of these schemes is practical or satisfactory, and it may be necessary to run a power shovel through the cut once or twice. If this is done, the excavation should extend several feet below the subgrade, for in this way it may be possible to provide sufficient room for the material to reach its angle of repose. After the excavation is completed, a deep surface ditch parallel with but some distance from the track may be an aid in draining both the sliding material and the roadbed. If the excavation is not successful in stopping the slide, it will at least protect the track for a time by providing room for the inflow of material, and can be repeated when necessary.

One thing to keep in mind when dealing with slides is that half-way measures are never successful. Whatever method of correction is to be applied, it should be decided on only after careful study of all of the conditions surrounding the trouble and assurance that the solution is adapted for the problem. It is an unfortunate fact that too often corrective measures have been undertaken without sufficient study and that failure has been recognized only after considerable useless expenditure has been made. Again, managing officers may be reluctant to authorize an expenditure of the magnitude necessary to solve the problem, in which event local officers are compelled to adopt temporary measures merely as an expedient to keep the line open. Experience has demonstrated that slides can be controlled only through a suitable and adequate plan of action and a determination to carry it to completion; anything less is usually a waste of money.

Work Equipment

A Valuable Adjunct to Safety

DURING the last 10 years the maintenance of way departments of the railways have made a remarkable improvement in their accident record. Year after year the total number of reportable non-train accidents has decreased until for the Class I roads of the country they amounted to 4,845 in 1937, the last year for which complete data are available, as compared with a total of 22,826 in 1927, only 10 years earlier. This represents a reduction in these accidents from 21.7 to 10.8 per million man-hours worked.

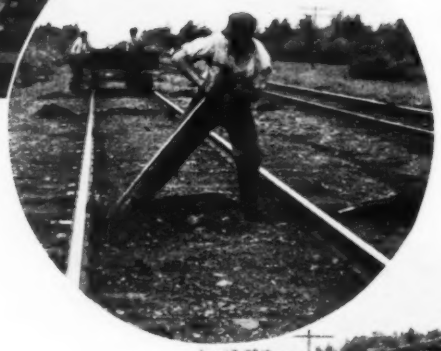
For this enviable record which has been made, no single factor is responsible. It has come about as the result of an intensive drive by railway managements and maintenance officers all of the way down the line, in the way of increased education, closer supervision, formal and informal safety meetings, the publication of safety bulletins and records, and numerous other means, all of which have contributed a part. Without any thought of depreciating the value of any of these means, it is unquestionably true that some are more effective than others, and, at the same time, without any accurate method of determining their relative effectiveness, that some of the most effective means are rated erroneously.

In this latter category may well be placed the increasing use of power tools and heavier work equipment. Without some suggestion, many would overlook the important part which this has played in the improved accident record of maintenance of way departments generally, and possibly with some excuse, because power tools and other work equipment have assumed the place that they have largely through considerations of increased efficiency and economy, rather than those of reducing accident hazards. However, the fact that equipment has played an important part in reducing accident hazards is without question, as is evidenced in the fact that some of the largest reductions in the number of accidents in the maintenance of way department have occurred in those classes of operations most fully mechanized.

Definite statistics to bear this out are not available as regards individual operations, but the accuracy of this observation is reflected further in the tabulation of the Safety section in its annual reports relative to the number of accidents that have occurred during the 10-year period of 1929 to 1938 in the handling of rails, ties, bridge timbers and other heavy materials. This tabulation shows that whereas there was a total of 6,036 casualties (killed and injured) in carrying out these classes of operations in 1929, there was a total of only 1,282 casualties in carrying out similar operations in 1938, a reduction of 78.8 per cent. It is also reflected in the accident records of individual mechanized gang organizations, many of which now go through season after season without casualties, whereas only a few years ago, employing hand methods largely, casualties were frequent and to be expected. Only recently, a maintenance officer, having jurisdiction over approximately 6,600 miles of tracks and as many as 3,600 employees, pointed out that whereas rail laying operations on his territory until recent years, largely by hand methods, invariably caused four or five reportable accidents each season, his rail laying forces during the last three years, equipped with power spike pullers, rail loaders, power adzers, rail cranes and power spike drivers, have not had a single reportable accident.

While it is felt that the machines themselves have been directly responsible for much of this improvement in the safety record of gangs, relieving the men of arduous and hazardous tasks as done by hand, it is unquestionably true that much of the credit can be attributed to the specialized gang organizations which have come about largely as the result of power tools and machines, with their generally younger class of men, definite assignment of tasks, trained operators, and the lack of bunching of the men that was so frequently necessary where hand tools alone were employed. In either case obviously the improvement in the accident record which has resulted should be credited to the use of equipment, a fact which should not be overlooked in appraising the full value of work equipment in maintenance of way work.

How the Great N



Above Left—Sawing the Old Ties, While a Man Cups Out Small Ballast Pockets Ahead. Left—Barring Out a Sawed Off Tie End. Below—Removing the Old Ties in Three Pieces

Completely revising its former method of making tie renewals, the Great Northern has given up the digging in of ties by section forces, and has substituted a method employing district gangs, equipped with tie cutters which permit the removal of the old ties in three pieces, with minimum disturbance of the ballast and roadbed. As a result, it is speeding up its tie renewals; is securing a higher quality of work; and is saving approximately 12 cents on each cross tie renewed

THROUGH the use of 32 tie-cutting machines, designed to permit the removal of old ties from the track in three pieces with minimum disturbance of the ballast and roadbed, coupled with the employment of carefully organized district tie renewal forces, the Great Northern, in its 1939 tie renewal program, which is already practically 50 per cent completed, is effecting a saving of approximately 12 cents a tie over its former method of digging in ties. On the basis of approximately 900,000 ties to be renewed this year by the new machine-equipped organizations, this will mean an aggregate saving to the road in excess of $100,000 in carrying out this year's renewals. Furthermore, through the use of the tie-cutter method, which is greatly increasing the output of each man over the digging-in method used formerly, it expects to complete its tie-renewal program far ahead of what could be expected otherwise, and is convinced that the results being secured in minimum disturbance of the roadbed and track level are superior to those possible with the digging-in method.

Former Method of Renewal

Tie renewals on the Great Northern have been carried out heretofore by the regular section forces, employing the digging-in method almost exclusively, followed by such spot surfacing as was necessary to stabilize and smooth up the track. In recent years, with the section gangs reduced in size generally to a foreman and one or two men during the winter, they generally were increased by two or three men with the opening of the working season, primarily to permit the making of tie renewals.

The digging-in method employed was much the same as has been used by roads generally since the early days of timber crosstie construction, involving the cleaning out of the crib adjacent to the tie to be removed, usually to a depth of an inch or more below the tie bed; the pulling of the spikes from the old tie; and the knocking of the old tie laterally into the cleaned crib area, followed by the pulling out of the old tie with picks, the redressing and lowering of the old tie bed to receive the new tie, and then the pulling in of the new tie with tongs directly over the old tie bed. This was then followed by the refilling of the crib, the tamping up of the new tie, the springing in of the tie plates, gaging, spiking, redressing ballast and disposal of the old tie.

This method, involving 13 separate operations, necessitated the reuse of at least six different tools during the renewal of each tie, requiring the men to pick up and drop tools repeatedly and to keep them moved ahead from one tie to the next as renewals progressed. At the same time, this method of making renewals, spread out as it was over the entire summer and fall, was not conducive to the economical distribution of the new ties along the right-of-way, because it was not deemed safe, or good for the ties, to unload them from cars directly at the points of renewals, and to allow them to lie along the tracks for such

t Northern

Cuts Tie Renewal Costs 30%

a long period before being put in service. Therefore, it was the practice to pile the ties as received at convenient locations along the tracks, usually including station grounds, and subsequently to distribute them by push cars or trailers as the renewal operations progressed.

Adding to these disadvantages of the digging-in method as carried out by the section forces was the important consideration that this method of making renewals was recognized as unduly destructive of the roadbed, requiring the removal of the ballast in the cribs to a depth below the bottoms of the ties, often greatly disturbing the old tie bed itself, with resulting disturbance of the surface of the track. Furthermore, the digging-in method, with the extra labor involved in cleaning out cribs, was a constant source of temptation to the section forces to take out adjacent ties when cribs were opened, frequently sacrificing service life still in the second tie in order to minimize crib-cleaning operations. Wherever this temptation was yielded to, not only was one or more years of tie life lost, but at least a temporarily weakened spot was created in the track which remained until the material under the new ties had become thoroughly compacted and the ties had been brought back up to true level by further tamping. The Great Northern permits the renewal of but one tie in a place.

Still another disadvantage of the section gang method of digging-in ties was the time that was required to complete the tie renewals, regardless of the practice of starting renewals on each part of the road as early in the spring as roadbed conditions would permit. Seldom did any division complete its tie work before September 1, and, not infrequently, it was late in October before the program of the road as a whole had been fully completed. This had the two-fold disadvantage of mixing tie renewals with all other classes of section work throughout the working season, which was not conducive to the greatest efficiency, and the disturbance of the track so late in the year, at least in some territories, that, in spite of additional work put on it, it was not possible for the track to become fully stabilized before winter set in.

Jacking Method Tried

In spite of the disadvantages of the digging-in method of making tie renewals, it was continued year after year for lack of something better, with an average production, varying to some extent with the class of track, type of ballast and the extent of traffic delays, but for the road as a whole, generally in line with the long established rule of one tie per man-hour. Attempts had been made to better this production, eliminating some of the crib cleaning work, by jacking up the track an inch or more, when ballast conditions were favorable, to permit the removal of the old tie. This, however, resulted invariably in rough track, which could be remedied only by much subsequent work by the section forces. Only when combined with

From Left to Right—The Ballast Trough As It Appears Upon Removing a Tie. The Tie Bed is Not Disturbed in Dressing Up the Trough. Note the Tight Fit of the New Tie as it is Pulled in Place. A Minimum, and Frequently No Tamping Is Required

general resurfacing could the jacking method of renewals be employed satisfactorily, and the cost of this resurfacing was considered prohibitive except when general resurfacing was called for regardless of such disturbance of the track as might be occasioned by tie renewals.

Now Using Tie Cutters

Confronted yearly with this problem of tie renewals, which during the last ten years has involved an average of approximately 1,300,000 ties each year, the Great Northern has been alert to any means or methods offered to reduce the cost of making renewals and to minimize the disturbance of its track in effecting them. In 1937 it experimented with a machine designed to accomplish both of these ends, and in 1938 purchased eight of them. Finding the machines highly effective, it purchased 24 additional machines early this year to speed up and cut the cost of its 1939 tie program.

A Close-Up of the Tie Cutter in Operation, Which Makes Each Cut in About 30 Sec.

The machine being used is a tie cutter, which, operating on the rails, is designed to saw the old ties into three pieces by making two cuts, one just inside the rail and tie plate on each side, permitting the old ties to be removed in three pieces without cleaning out the adjacent crib or disturbing the surface of the rail. The saw of the machine, which is operated by a 2-hp. air-cooled engine, consists of a long, tapered, vertical steel arm, with a removable cutting blade, with two cutting teeth and two rakes on its lower end. This arm, which is about 1½ in. wide at its upper end and about 4½ in. at its lower, or cutting, end, is pivoted at the top to a raising and lowering handle and is operated back and forth crosswise of the tie by a rocker arm connected to a crank on the engine. The cutting stroke of the blade is adjustable, and, combined with slight motion of the machine as a whole back and forth, produced by the operator, the saw can cut ties of any width.

The speed of cutting and the depth of the cut are both controlled by the operator, who can lighten or increase the pressure on the blade through the operating handle in accordance with the character of the wood being cut, and who raises the saw blade out of the tie just as soon as he senses by sound or feel that the cut has been completed. The time required to make each cut varies slightly with the character and condition of the wood in the old tie, but, on the average, requires only about 30 seconds.

Protecting the Saw

The only operation in connection with the machine prior to making a cut is the digging of a small hole directly along each side of the tie at the point of cut, to prevent the fouling of the saw blade by the ballast as it breaks through each side of the tie on its crosswise travel. This is done with a heavy bar furnished with the machine, which has a spoon-shaped lower end to quickly cup out the openings desired. Regardless of the character or condition of the ballast, it has been found that one man with one of these tools can readily keep ahead of the saw.

The removing of the ballast immediately adjacent to the sides of the ties at the points of cut practically eliminates contact of the saw teeth with the ballast, except at the extreme bottom of the cut, just as the tie is cut completely through. Even at this point damage to the teeth can be minimized by careful attention by the operator, so that it is not uncommon to be able to make from 30 to 50 cuts with each blade between sharpenings. In the bank run gravel ballast on the Great Northern, the average number of cuts between sharpenings has been approximately 35.

The resharpening of the saw teeth can be done in the field, as the saw blade is readily removed, and each machine is equipped with a power-operated wheel grinder, fastened to its frame. However, enough blades are provided with each machine to make sharpening operations in the field unnecessary, except as an operator may desire to sharpen a saw in spare moments or while he may be delayed by trains.

Roadbed Not Disturbed

In addition to the function of the tie cutter in permitting the quick removal of the old ties without the necessity for cribbing out alongside, it permits the pulling in of the new ties with minimum disturbance of the old tie bed. In loose ballast, some of the ballast sloughs off into the trough as the sections of the old tie are removed, requiring some cleaning out of the trough, but the old tie bed is not disturbed more than enough to permit the pulling in of the new tie to a snug fit beneath the rail. If this practice is followed carefully, there is minimum necessity for tamping of the new tie, and the thickness of the tie plates, applied subsequently, compensates for the slight compaction of any loose ballast under the tie under traffic, insuring quick stabilization of the roadbed in good surface. Supplementing these operations in the tie-cutter method of renewal, the only remaining operations include the gaging and spiking of the rail and the replacement of the relatively small amount of ballast removed in dressing up the tie trench and that displaced in breaking into the shoulder in order that the new tie can be pulled in place.

Use Cutters Two Shifts

With 32 of the tie cutters on the Great Northern, divided between all of the 8 divisions on the road, from Duluth, Minn., and St. Paul to the Pacific coast, the tie renewal organizations on the road this year are based upon the renewal of approximately 900,000 ties, or approximately 72 per cent of the year's program, by the tie-cutter method. The organizations employed with the tie cutters have varied somewhat to date on the different divisions in attempts to meet special conditions and to determine the most efficient basic organization for ultimate adoption by the road as a whole. In the main, however, all of the organizations have been predicated on an attempt, under the conditions prevailing, to secure the maximum output of the tie cutter; that is, supporting it with a force sufficient to keep up with its maximum capacity.

In fact, the organization which is now favored on the road and used by all but a few of the machine-equipped gangs, is one which calls for double-shifting of the saw. Under this plan of operation, the saw is worked two eight-hour shifts each day—from 4 a.m. to 12 noon, and from 12 noon until 8 p.m.; and is supported by a gang of sufficient size to keep renewals closely behind, the gang working a single shift of eight hours, usually between 8 a.m. and 5 p.m. This plan is predicated upon a willingness to permit ties, with one cut through them, to remain in the track over night, because, continuing on its second shift after the renewal force has stopped for the day, the saw makes a single cut in from 100 to 150 of the ties to be renewed the following day. Then, starting out in the morning ahead of the gang, it continues ahead of it, making the second cut, leaving the ties in three sections, ready to be removed from the track.

District Gangs

Departing completely from the section gang plan of renewing ties, the saw-cutter organizations are specially formed district gangs, recruited from former section men and local farm boys, which stay together for the season, working progressively over the tracks of the division according to a predetermined program, and housed and boarded in camp cars. The typical organization, which supplements the regular section gangs, and in no way interferes with their work, consists of two saw cutter operators (one for each shift of the machine); two men cupping out holes alongside the ties to be renewed, to protect the saw (one for each shift of the machine); one man with a claw bar pulling spikes and assisting in the lifting out of the old ties; two men, with a broad chisel-pointed bar and a push car, barring out the cut off ends of the ties and loading and disposing of the old pieces of ties; six men, working in pairs, with shovels and tie tongs, cleaning out and dressing up the old tie troughs, pulling in and tamping up the new ties, and shoveling back the small amount of ballast removed in preparing the trough; one man, with a special two-prong pinch bar, springing up the rail and inserting the new tie plates; two men gaging and spiking the new ties; and one man redressing the ballast shoulder and between rails as may be necessary—a total force of 17 men and a foreman.

The chisel-pointed bar employed to remove the sawed off tie ends is driven by hand vertically into the saw cut and then, in a prying action against the center section of the tie, is used to force the free end out from beneath the rail. The bar is used also to pry up the freed end and center sections of the ties, loosening them in the ballast so that they can be picked up readily by hand for loading on the push car. Usually one thrust of the bar beneath each section of tie is sufficient for this purpose.

The rail-springing tool used to permit the placing of the tie plates is essentially a sturdy steel bar with two heavy flat-faced prongs at its lower end, spaced about 10 in. apart and connected about 4 in. back from their tips by a heavy cross bar. With this cross bar resting on the new tie to be plated, and employed as a pivot, and with the prongs inserted beneath the rail base on each side of the tie, the weight of a man on the outer end of the handle is enough to spring the rail and depress the tie sufficiently to permit the slipping of the tie plate into position. A special feature of the tool is a hook near its outer end which can be caught under the head or base of the rail opposite that being sprung, to hold the tool in its downward position so that the man employing it is free to complete the operation of placing the tie plate under the rail without assistance.

Conditions Affecting Work

To enable one to appraise accurately the conditions under which the tie renewals are being made on the Great Northern and the speed and economy with which the work is being done, it should be made clear that for the most part the tracks of the road are ballasted with bank run gravel, containing a small percentage of large stones and a large percentage of fines, although in some territories a less favorable ballast, containing a large percentage of large stones, is used, for lack of a more suitably graded material. On the Western lines, a considerable amount of crushed and screened washed gravel ballast is used. It should also be pointed out that, in main tracks, 7-in. by 9-in. by 8½-ft. treated ties are largely replacing treated and untreated ties of the same size, although in many cases they are taking the place of ties of an earlier standard size of 6-in. by 8-in. by 8-ft. In branch lines the smaller standard size still prevails largely, so that the new ties replace ties of the same size.

Traffic delays to the work vary in different territories, but are seldom excessive, and travel time of the men to and from the points of work is cut to a minimum by equipping each gang with a motor car and trailer, and by keeping the camp trains moved ahead as the work progresses. The tie cutters, weighing only approximately 300 lb., are readily removed from the track by the operator to clear for traffic, and are transported to and from the camp each day on either the trailer car of the gang or on the tool tray of its motor car.

Other features having a bearing upon the production of the gangs are that while the numbers of tie renewals being made per mile over the system vary quite widely with varying conditions, they are averaging generally between 100 and 120 ties to the mile for both main and branch line tracks; that many siding renewals are completed at the same time that renewals are made in the running tracks; and that generally, in double-track territory, the renewals of the ties in both tracks are made simultaneously as the work progresses, to minimize the amount of walking time each day and the loss of time in back travel, and to minimize the number of moves of the camp trains.

With This Tool, One Man Inserts the Plates on the New Ties

As might be expected, reflecting all of the variable factors involved in this work, including the size of organization and weather conditions, the total production of the different gangs over the system has varied considerably, as has also their daily production. However, on the basis of daily and weekly reports to June 3 from gangs on the Eastern lines of the road, involving the renewal of 151,762 ties by the machine method to that date, the daily average pro-

(Continued on page 416)

Grouts Ballast

For Better Roadway Support

IN November, 1938, the Pennsylvania initiated a novel experiment in sub-ballast track support by grouting new ballast in place to form slabs 10 ft. wide and 12 in. thick under its two main tracks at a troublesome soft spot in its Cleveland-Pittsburgh main line near Bedford Yard, about nine miles southeast of Cleveland, Ohio. Two methods of installation were used and a total length of 1,200 ft. of slab was grouted, 600 ft. under the eastbound main and an equal length under the westbound main. The traffic at this point includes approximately 14 million gross tons of freight annually over each main track, in addition to ten passenger trains with scheduled time card speeds of 70 miles per hour.

Expensive Maintenance

At this location, two main tracks and a siding lie in a cut about 15 ft. below a residential district on the south and about 3 ft. below the level of Bedford Yard on the north. The siding lies south of the main tracks, 13 ft. from the eastbound main. The subgrade soil in the cut is a type of blue clay commonly encountered in the region of Lake Erie, which, under unfavorable conditions of moisture and loading, flows laterally, forming water pockets and causing soft track.

Maintenance at this location has been difficult and expensive and corrections of line and surface, frequently involving a lift of 2 in., were required about twice a week. Several years ago efforts were made to drain the track by installing tile in the ditches on both sides, but after functioning for a short time, the tiles were broken and forced to the surface. The decision to experiment with a cement grouted slab to stabilize the roadbed was made in the belief that substantial economies might be realized.

After it was determined to proceed with this work in the fall of 1938, it was planned to grout a 600-ft. section of slab under the eastbound main, with traffic diverted over the siding, and to grout another 600-ft. section of slab under the westbound main in short sections by diverting one westbound passenger train and all westbound freight trains around Bedford Yard during a construction period from 11:08 a.m. to 6:00 p.m. each day. In the latter portion of the program the track was to be relaid and surfaced on the freshly grouted slab for immediate use each evening. The entire project was planned to be done with standard materials, equipment and labor available on the Cleveland division, supplemented by some machinery and equipment recruited from other divisions.

Selecting a section of double track main line carrying heavy traffic at high speeds, which had been difficult to maintain because of the unstable character of the sub-grade, the Pennsylvania has constructed a section of grouted ballast slab for sub-ballast support under each main track, using several methods

Grouting With Traffic Diverted

The first half of the program was begun by disconnecting the eastbound main at each end of the 600-ft. section, lining it over and connecting it to the siding. The 600-ft. section of eastbound track was then removed. The rails were dragged out of the way by a locomotive, without being disconnected, and the ties were removed and placed on the side of the cut. Four crawler gas cranes with ¾-cu. yd. buckets, mounted in gondola cars, were used to excavate the old ballast. The excavation was carried to a level two ft. below the bottom of the ties and was deposited in empty gondola cars between the cranes and hauled away. No effort was made to excavate exactly to grade, and an extra gang completed the grading by hand. A bridge and building gang then set the 12-in. side forms as the excavation progressed.

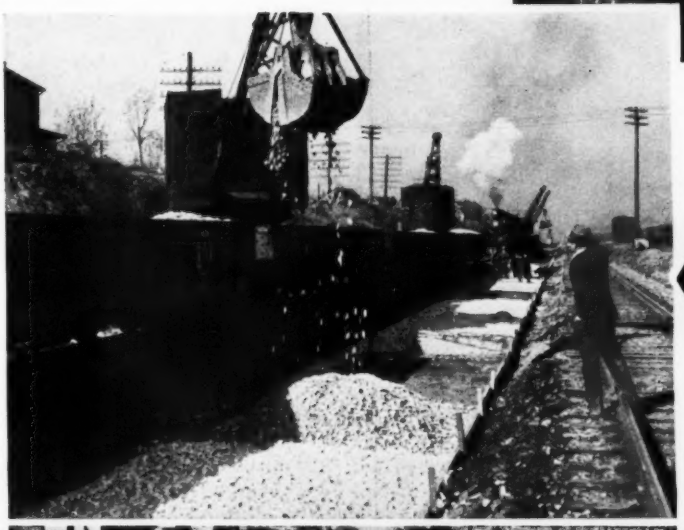
The new crushed rock for the grouted slab, which was standard ballast ranging from 2½ to 1¼ in. in size, was unloaded from gondolas by gas cranes directly onto the subgrade. All four clam-shells were used to unload the ballast and the work train time required for unloading 240 cu. yd. was 6½ hr. Laborers leveled the ballast to the top of the forms as fast as it was deposited by the cranes, giving it a 1-in. crown at the center, and two men, using a 12-in. by 12-in. oak tamper, compacted it.

Mixer Train Used

A mixer train was used for the grouting operations, which operated on the two near tracks of Bedford Yard. On the first track were four sand cars, two on either side of a flat car holding two 10-S mixers, an air compressor car and two steam locomotive cranes. On the next track, two box cars containing cement were secured to the mixer car so that the entire set-up could be moved along on both tracks by the locomotive cranes as grouting progressed westward from the upgrade end. The grout was delivered from the two 10-S mixers into a 38-cu. ft. grout tank. An agitator paddle operated by an air motor in the bottom of the grout tank kept the grout thoroughly mixed as it ran out by gravity through a 50-ft. length of 2½-in. firehose to the ballast. A valve at the bottom of the grout tank controlled the flow.

Frequent checks of the consistency of the grout were made with a flow cone and its consistency was maintained at 21 sec. as measured by the cone. The charge for this mix was three sacks of cement, 600 lb. of damp sand, containing five per cent surface moisture by weight or 3½ gal. free water, and 21 gal. of added water. The water-cement ratio at the mixer was thus 8.2 gal. per sack of cement. The added water was

1—Four Cranes Excavating the Old Ballast from the Eastbound Main. Eastbound Traffic was Diverted over the Siding in the Foreground



2—Unloading the Ballast for the Slab. 3—Showing the Mixers on the Mixer Train and the Grouting Work under way Below

measured by a 5/8-in. water meter at each mixer. Each batch produced about eight cubic feet of grout.

Grouting Organization

Grout was distributed by one man at the nozzle of the hose, and by two men with warehouse brooms brushing excess grout ahead or into voids where needed. Evidence of the penetration of the grout into the ballast was observed in holes dug ahead of the grouting for purposes of observation. Such observations indicated that the grout ran forward on the subgrade and started filling upward about four feet ahead of the hose. As the grouting proceeded the oak tamper was used again for compacting the grouted ballast, but no effort was made to produce a finished surface.

The grouting crew consisted of a foreman and 16 laborers from an extra gang, a foreman and 7 bridge and building men and one compressor operator. Six men (three at each mixer) shoveled sand and six others wheeled sand to the mixer skips. Two men carried cement to the mixers and two others dumped it into the skips. Two men operated the mixers and two men were stationed at the water meters. One man operated the discharge end of the hose, two men distributed excess grout with brooms, and two men tamped the grouted stone.

Ten Days' Curing

Because cool weather and rain followed the grouting, other curing was considered unnecessary, and the work of replacing the track and reballasting was started on the third day after the grouting. New rock ballast of the same size used for the grouted slab was used and the track was jacked up on it to provide 12 in. of ballast between the slab and the ties. Ten days after the grouting had been completed, the track was connected with the main line, and placed in service. Trackmen made minor corrections to the line and surface for several days before all speed restrictions were removed.

The second part of the project, grouting a slab under the westbound main while traffic was maintained, was performed with a similar sequence of operations, with the exception that the full cycle of operations, including track removal, excavation, placing and grouting slab stone, placing new top ballast and reassembling the track for traffic, were completed for a short section each

day during the period the track was available. Under this plan on three successive days, 66, 58 and 78 ft. were completed, respectively.

Two steam cranes, operating on the near track of Bedford Yard, were used for excavating. As soon as excavation permitted, the subgrade was leveled and the side forms set. Two clam-shells, operating from another yard track, dropped new rock ballast onto the prepared subgrade from a considerable height. This ballast was carefully leveled on top, but was not compacted with the tamper as was done for the slab on the eastbound main. The mixer train and crew began grouting operations as the excavation equipment moved away. Grouting methods were identical to those employed on the eastward slab except that consistency of the grout was thickened slightly to a 23 to 24 sec. flow. This mix, although more sluggish, proved very satisfactory and will be used in further work of this character.

4—The Grouting Work in Progress, Two Men with Brooms Brush the Grout from the Hose Ahead into the Ballast. Note the Flow Cone in the Lower Right Hand Corner Used to Test the Fluidity of the Mix

Track Relaid on Fresh Slab

As soon as 10 or 12 ft. of ballast slab was grouted, top ballast was dropped on it and leveled 12 in. above the top of the slab. By the time grouting of the section was completed, more than half of the top ballast was in place. The track was relaid as quickly as possible and lined and surfaced for immediate use. In order to study the effect of definitely separating the top ballast from the slab, empty paper cement sacks were placed to cover about half of the freshly grouted surface.

An interesting feature of the grouting work on the westbound main was the complication caused by a heavy rain. Pools of water on the subgrade, augmented by surplus water from the grout, accumulated at the end bulkhead. Despite the use of a pump, water completely filled the stone and covered the side forms but because the track had to be reassembled for traffic, it was necessary to grout into the water. When the end of this slab was uncovered two days later, no damage was observed from either traffic or excess water. Another feature of the latter part of the program was the use of dynamite to loosen the tough mixture of clay and old ballast to speed the excavation. After 202 ft. of slab had been grouted on the westbound main, the remainder of the work was postponed because of the approach of winter.

Completed Work this Year

Early in June of the present year, the Pennsylvania resumed the grouting work in the westbound main, carrying out the work with the same equipment and in the same manner used in grouting the 202 ft. of slab under traffic in this main last fall. On June 7, 8 and 9, sections of slab 28½ ft., 35½ ft. and 73½ ft. long, respectively, were grouted. Thereafter, approximately two rail lengths was completed each succeeding day until the remainder of the planned 600 ft. of grouted slab was completed.

Last fall, after the grouting work had been stopped, two test specimens, each 3 ft. by 10 ft., were cut from the slab under the eastbound main and were shipped to the laboratory of the Portland Cement Association in Chicago, and in June, following completion of the slab under the westbound main, two test specimens were cut from this slab, one from that portion which had been completed last fall, and the other from the portion of slab which had been completed recently.

Flexure Tests

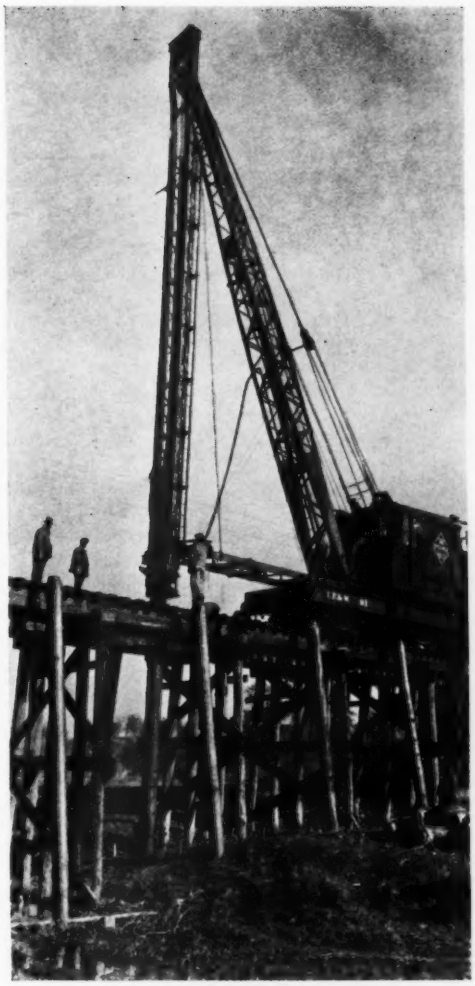
After the specimens taken from the eastbound main had cured for three months, flexure tests on them showed a modulus of rupture averaging 441 lb. per sq. in., which would indicate approximately 2,500 lb. per sq. in. compressive strength. Examination of sawed portions of these specimens showed complete penetration of the grout between all of the stones and no honeycombing. Although the flexure tests did not indicate as high a strength as might be expected for slabs constructed under more favorable circumstances, the results of the tests were considered satisfactory, in view of the fact that unfavorable weather conditions, with low temperatures, existed at the time of grouting and curing.

The test specimens taken from the westbound main have not been tested as yet, but examination of the slab in place indicates that the passage of traffic immediately after the grouting did not injure it. When the test specimens were removed from the track, it was observed that the grout filled all the voids and irregularities in the top of the subgrade, forming a close bond between the grouted slab and the subgrade underneath.

5—Reassembling the Eastbound Main Track on the Completed Slab

Stepping Up Efficiency in Timber-Trestle Work

This is an abstract of a report presented at the March, 1939, convention of the American Railway Engineering Association by the Committee on Economics of Railway Labor. It comprises part of a general study of the organization of forces and methods of performing maintenance work, and contains a number of suggested gang organizations for conducting timber-trestle work efficiently



Pile Driving Equipment Is Essential

PREVIOUS studies of gang organizations made by this committee have dealt with the major operations required in the maintenance of railway tracks and roadway. Since these operations each comprised a definite number of steps, they were susceptible of complete analysis. Once the required number of steps is determined, they are repeated in identical manner during a time interval necessary to produce a given result. Thus, it was possible to evaluate the several steps, and arrange for each man the work he was to perform in routine manner, repeating the same operations daily. It may be said, then, that these major operations are of a type that lend themselves more or less readily to definite organization of the working forces.

The present assignment, covering forces working on wooden trestles, cannot be given precisely the same treatment as outlined in the foregoing paragraph. The work involved does not consist of a constant repetition of identical operations, but is comprised of a mixture of several operations, some of which are similar, but in which the similar steps do not follow one another with the same regularity. Hence, the problem lies more in determining the economical size and consist of gangs for carrying out a definite program than in a detailed analysis of gang organization and application.

To determine current practice in the organization of gangs used in the construction and maintenance of timber trestles a questionnaire was submitted to a number of railways, the response to which gave a representative cross-section of practices in effect on most of the railways that have a considerable volume of such work. So far as this was practicable the data thus obtained were assembled and equated for several of the various conditions encountered in trestle work. It appears clear from individual reports that the volume of new construction during the past few years has been inconsiderable. Also, it was found to be the practice on some railways to contract all new work of this kind.

Whatever the trend, it is customary on many railways to program sufficient pile driving and decking to keep at least one organization, equipped with a pile driver, busy during at least part of the year. Where this is the practice two gangs are usually used, including (1) a pile-driving crew, the function of which is the driving of piles and capping of bents only, and (2) a gang assigned to deck work.

Suggested Organizations

On the basis of the study suggested, gang organizations were established for (1) pile driving and decking, and (2) ordinary trestle maintenance. The organizations for the pile-driving and decking gangs are as follows:

Pile-Driving Gang

1 foreman
1 assistant foreman or lead man, when needed
10 carpenters, helpers and laborers
1 pile-driver operator
1 pile-driver fireman

Decking Gang

1 foreman
1 assistant foreman or lead man, when needed
12 carpenters, helpers and laborers

Working 260 days per year, with an average productive time of six hours per day, the pile-driving gang should drive 187,000 lin. ft. of piles per year, while the decking gang should construct 730 panels, averaging 12½ ft. in length, of new decking per year. The gangs also perform all necessary operations in opening and closing trestles, in retiring the old structures, and in cleaning up all old material. Each gang should be equipped with a self-propelling, full-revolving crane, power sawing, boring and wrenching tools, small tools and supplies. If required by conditions, a crane operator should be added to the foregoing organizations.

It was established that the general policy on the majority of the railroads during years for which a small pile-driving program is proposed, is to use a combination gang for driving and decking the structures. A suggested organization for such a gang is as follows:

1 foreman
1 assistant foreman or lead man, when needed
14 carpenters, helpers and laborers
1 pile-driver operator
1 pile-driver fireman

It is estimated that a gang embodying this organization will drive 90,000 lin. ft. of piles and complete the decking of 430 panels of open-deck construction annually under conditions similar to those outlined in the preceding paragraph, i.e., with the same daily detention and annual effective time and using similar equipment and tools.

Ordinary Maintenance

Due to the diversity and range of their work, gangs for ordinary maintenance or repairs are selected with less certainty of functioning economically. However, an organization composed of one foreman and eight carpenters, helpers and laborers is believed to be an effective gang for general purposes. Since adherence to a program for spot maintenance work is ordinarily more difficult than in the case of larger gangs working on out-of-face jobs, extra care should be taken to insure that the program will be followed as closely as possible. While a gang is engaged with some of its larger jobs, the assignment of a crane may be necessary to assist in handling the heavier timbers. Likewise, there will be cases in which economy will result by providing a small power unit for use in boring and wrenching operations.

The length of territory assigned to each maintenance gang varies, of course, with the potential volume of work. As it is not always practical to establish definite limits of the territory to be covered by a maintenance gang, the practice of one southwestern railroad in defining the annual volume of work assigned to each of its ten maintenance gangs is particularly noteworthy. The report from this road states in part:

"Normally we assign sufficient territory to each gang so that during the course of a year's time, or 275 working days (1½ hr. daily interruption anticipated), the gang will use approximately 400,000 ft. b.m. of bridge lumber and 150,000 ft. b.m. of bridge ties. . . . We have a total of ten such gangs assigned to the maintenance of 294,000 lin. ft. of wooden trestles scattered over 2,700 miles of operated line. The average trestle maintenance gang will have a district about 270 miles in length and will handle the ordinary maintenance of approximately 29,000 lin. ft. of trestles of both treated and untreated timber construction."

Portable Power Tools Increase Efficiency in Timber Deck Work

Programming Important

As with any enterprise, the importance of a carefully prepared and executed program for carrying out trestle repairs or construction work cannot be over-emphasized. Intelligent programming should of course be based upon factual data, which can probably be best secured through a personal inspection by a system bridge officer in company with local maintenance officers. There are several effective methods now in use for making such inspections. In most cases one general inspection, apart from other periodic inspections, is made annually in the early fall. Information is then assembled, and a program prepared for inclusion in the following year's budget. When the program has been approved, steps are taken to insure that the necessary material will be on hand at the bridge sites when required, and that the labor allowance is set up to cover the necessary organizations to carry on the work.

Flexibility Necessary

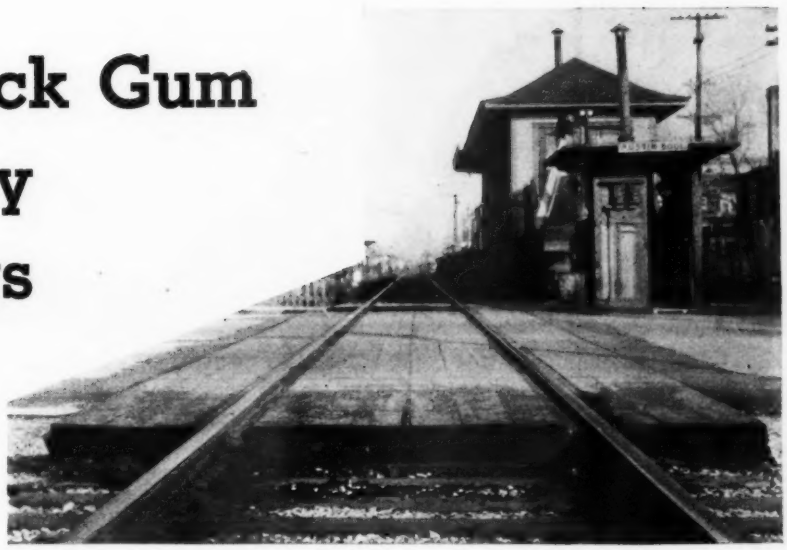
All of the gang organizations given above are designed for maximum production with a minimum waste of labor. The character of the work, however, is such that a certain flexibility is unavoidable—jobs differ, the personal equation is always a variable, co-ordination of gang movements and material shipments is sometimes lacking, and gang travel time and detention because of traffic, while estimated at what is believed a reasonably average figure, vary with each job and with the local conditions on each railway. It will be necessary, for instance, to use a laborer as a watchman, flagman or waterboy. Likewise, in a routine operation such as pile-driving, the working gang will necessarily be modified somewhat, depending on the extent to which the deck must be opened to permit driving.

It might be added that efficiency—as well as safety and convenience—will result from using (on these operations proper) six men or multiples of six in capping, eight men or multiples of eight in decking, and six men or multiples of six in the repair gang. A six-pile bent permits six men to work without crowding when the bent is ready to be cut off, and six men can occupy average size scaffolds with safety and convenience while performing their work.

Close Supervision Required

While trestle work ordinarily requires a greater concentration of men than is practicable in the larger gangs used in the major track maintenance operations, lack of supervision is at once manifested in lowered efficiency, in wasted time and materials, and in disruption of the regularity of such operations as are performed by the men in a routine manner. Such losses can, of course, be prevented by the exercise of proper supervision on the part of foremen and their assistants. Moreover, to the end that the entire program will be executed according to schedule, adequate division and system supervision is no less important.

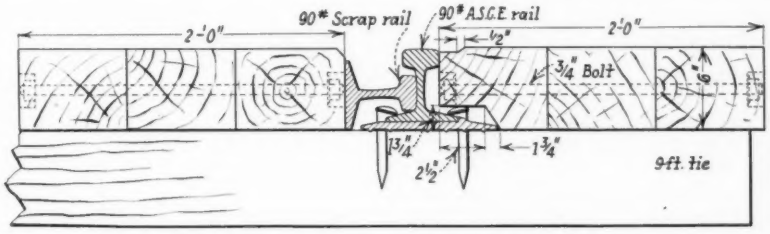
Treated Black Gum Highway Crossings



This Crossing, Installed in June, 1938, on the Douglas Park Branch at Austin Boulevard, Chicago, Carries Heavy Vehicular Traffic

THE Chicago Rapid Transit Company, Chicago, has a large number of street and highway crossings at grade in Chicago and adjacent suburbs. Nearly all of these crossings carry heavy traffic, and the traffic is so great over some of them that repair or renewal work must be done at night. These crossings are of many types including a large number of treated timber construction.

In the construction of timber crossings, this company has used creosoted black gum exclusively since 1931, because of its toughness, its resistance to checking and splitting and its long life when properly seasoned and treated. Before 1931, the Chicago Rapid Transit Lines used red oak and pine for this purpose, but the tendency of this timber to check and split in many cases, and to rot underneath during the later years of the life of the crossing, were factors in the decision to use treated black gum for all timber crossings.



Cross Section of One-Half of a Crossing, Showing Details of the Assembly of the Treated Black Gum Sections

Construction Details

In the construction of these crossings, black gum sections 8 ft. long, 2 ft. wide and 6 in. high, each consisting of three ties bolted together, are laid directly on the track ties and fastened to them with four countersunk ¾-in. by 10-in. lag screws. No shims are used as the sections are solidly supported on an even bearing by the track ties. Two of the sections are laid between the running rails of the track and two are laid outside the running rails, one on each side of the track. Flangeways are provided by laying scrap 90-lb. rails with the ball against the web of the track rail, and with the base against the center sections.

The sections are assembled by bolting together three black gum ties 6 in. by 8 in. by 8 ft. long, which have been surfaced, drilled and framed. They are bolted at three points with ¾-in. bolts and the nuts at each end of the bolts are countersunk in the ties in a $2\frac{9}{16}$-in. diameter hole. The outside sections, which fit against the ball of the track rail, are framed to allow room underneath for the tie plate, rail base and track spike when laid in place, and the tops of these sections are chamfered along the edge adjacent to the track rail to allow for future rail wear or settlement of the tie plate in the track tie, eliminating wear from overhanging wheel flanges which occurs in plank crossings when the timber becomes higher than the top of the rail. The center sections are framed with a ⅝-in. bevel adjacent to the flangeway. All framing and boring is done before treatment, with the exception of the drilling of the holes for the ¾-in. by 10-in. lag screws with which the sections are fastened to the ties of the track when the crossing is installed.

Treatment Used

When the first of these crossing sections were made, they were treated with six pounds per cu. ft. of a standard 80-20 creosote-coal-tar solution by the Rueping process. Owing to the fact that the treated timbers on the elevated railway structures in the city of Chicago must be comparatively dry, with very little bleeding, all treated timbers for the Chicago Rapid Transit Lines, with the exception of crossties for surface tracks, are now treated with straight No. 1 creosote oil. At the present time, the specifications of this company for black gum ties for assembly for crossing sections require that they be wintercut black gum properly piled for air seasoning; that, after proper seasoning, they be surfaced, beveled and drilled; that they be loosely assembled in sections and placed on trams for treatment, and that they be treated with six pounds per cu. ft. of straight No. 1 creosote oil by the Rueping process. The ties are inspected and culls eliminated before and after seasoning; they are inspected again after treatment. After treatment, the bolts are tightened and the sections are ready for shipment.

The installations of crossings on busy streets with heavy traffic sometimes presents serious difficulties. In some cases, because of the heavy traffic, the work is done at night; occasionally the street is blocked and

Two of the Oldest Treated Black Gum Crossings, Installed at 50th Avenue on the Douglas Park Branch in 1931, Which in Spite of Heavy Traffic, Show Good Surface and Little Wear

traffic detoured; and frequently a portion of the crossing is laid while allowing traffic to use the other portion of the crossing. The eight-foot black gum sections are very convenient for this purpose as they are light and easily handled and can be placed quickly, allowing a lane for traffic. In addition, they also permit easy removal of a portion of the crossing later, if necessary, for track repairs.

In the installation of these crossings, the general practice is to renew the ties out-of-face, remove the dirty ballast and give the track a light lift on clean rock ballast, approximately 1½-in. in size. The sections are laid in place directly on the track ties, $\frac{13}{16}$-in. holes are drilled and the sections are fastened to the track ties by ¾-in. by 10-in. countersunk lag screws. The lag screw holes are not prebored at the treating plant, because this would necessitate spacing the ties when the crossing is installed. However, the ¾-in. lag screws, when turned into the $\frac{13}{16}$-in. hole, make a very tight fit and the countersunk heads are sealed in the top of the crossing sections with mastic. This is considered ample seal against moisture entering.

Increased Service Life

Since this design of crossings was first installed by the Chicago Rapid Transit Lines, 54 such crossings have been placed in service, varying in length from 24 ft. to 56 ft., and two crossings have been renewed because of street changes. The first black gum crossing was installed in 1931 at 50th Avenue, a street with considerable traffic, on the Douglas Park branch. This crossing today shows very little wear, no evidence of checking or splitting and the sections have remained firmly in place despite the traffic continually passing over them. Before black gum sections were used, the average service life obtained from red oak or pine timbers in such crossings was approximately 12 years. It is conservatively estimated that the black gum sections, although subject to vehicular traffic of considerably greater volume and weight than formerly existed, will give from 18 to 25 years service life.

The design, treatment and installation of these crossings on the Chicago Rapid Transit Lines was made under the general direction of R. N. Wade, engineer of maintenance of way; the selection, inspection and treatment of the timber was done by the T. J. Moss Tie Company, St. Louis, Mo., under the supervision of F. N. Graham, general supervisor of material for the railroad; and the installation and maintenance of the crossings was under the supervision of R. E. Harmon, track engineer.

Cuts Tie Renewal Costs 30%

(Continued from page 409)

duction of 15 gangs, employing 16 tie cutters (one gang employing two machines for one shift instead of one machine for two shifts), ranged from 218 to 516 ties, with a general average for all of the gangs of approximately 350 ties per day. This represents for the different gangs from 12.5 to 17.5 ties per man per day, with an average for all of the gangs to June 3 of approximately 16 ties per man per day.

High Production

Typical of the records of the various gangs are those of two, one working on main line tracks, and the other on branch line tracks, given in the following: The former of these, working on the single-track main line track between St. Paul and Duluth, started tie renewals in this territory on April 25, and, in 32 working days to June 1, had renewed 9,408 ties. This was an average of 294 ties per day for the gang and 15.47 ties per man per day, including the foreman, 2 machine operators (double shift) and 16 laborers. The branch line gang to be referred to included a foreman, two machine operators and from 20 to 22 laborers, and employed two tie cutters for one shift each day. This gang started tie renewals at Sioux City, Ia., on the Sioux City-Duluth line, on March 24, and by June 3 had moved progressively over 235 miles of line, and had replaced 28,360 ties, this representing an average of 516 ties per gang day, and an average of 17.5 ties renewed per man per day.

An analysis of all of the district-gang, machine tie renewals on the Great Northern this year to date indicates clearly that this method, at least under the general conditions prevailing on this road, is far more rapid and economical than the digging-in method as used formerly; that when the road is equipped with sufficient machines to carry out all of its tie renewals by the cutting method, it can complete its tie renewals early in July instead of late in August or early September, making it possible to turn the men over to other production work; and that the quality of the work being done by the tie-cutter method in preserving the solidarity and surface of the track is superior to that possible employing the digging-in method of tie renewals.

Large Savings

As regards costs, it is estimated by the road that through the use of the machine organizations it is saving an average of at least 12 cents per tie renewed, giving full consideration to the higher wages of the machine operators, the costs of fuel, lubrication, saw blades and machine repairs, and a depreciation charge of $1 per day per machine for each day (one or two shifts) worked. On the basis of this estimate, and, assuming that the favorable performance of the gangs continues, as it is expected it will, it is anticipated that the total saving resulting from the present method of making renewals, for the 900,000 ties to be renewed by this method in the 1939 program, will amount to approximately $108,000.

While tie renewals on the Great Northern are carried out under the immediate supervision of the division roadmasters and their respective district roadmasters, the program as a whole is carried out under the general supervision and direction of J. R. W. Davis, chief engineer, and the two general roadmasters of the Great Northern—R. S. Kniffen, on lines east of Williston. N.D., and G. G. Smart, on lines west of Williston.

Keeping Fires Out of Coaling Stations*

BY W. E. CATHCART

Insurance Department, Pennsylvania
Philadelphia, Pa.

Fire Hazards Are Greater in Frame Coaling Stations

From a background of long experience in insurance matters and fire prevention work, the author of this article points out the safeguards necessary at coaling stations to eliminate many of the causes of fire

A COALING station is a facility of such importance to the operating department that it must function continuously, or at least be in condition to do so. Because of the character of its construction, a coaling station cannot be replaced immediately if it is destroyed by fire, nor can its functions be transferred to some similar facility at another point, as may be done in the event a shop is burned. A fire in a coaling station thus not only places a handicap on the movement of trains and increases the cost of refueling locomotives, but it may halt trains until the debris from the fire can be removed from the tracks. These facts emphasize the importance of adhering closely to recognized fire prevention and fire protection practices, both to avoid destruction of property and to prevent interruption to train service.

Fire hazards are not numerous in coaling stations, and by the exercise of care most of them can be safeguarded effectually with comparatively little expense. Carelessness is an inherent cause of fires in these structures, which can be controlled by proper supervision of the employee in charge. Periodic inspections by a representative of the insurance or fire protection department will be beneficial with respect to effective supervision and adequacy of the preventive and protective measures.

*This discussion was submitted for publication in the "What's the Answer" department in the January issue, in answer to the question of how best to prevent or extinguish fires in coaling stations. Because of its comprehensive character, it was withheld for presentation here as an independent article. For further discussion of this subject, see page 36 of the January issue.

Wiring Must Be Protected

Electrical equipment should be in stalled and maintained in accordance with the National Electrical Code. All wiring should be in conduits, with allowance for vibration. Motors exposed to dust-laden atmosphere should be enclosed in a tight compartment of non-combustile material, with adequate ventilation to free atmosphere. All metal enclosures should be grounded. In some cases, the application of non-combustible material to exposed surfaces may be sufficient to safeguard against a motor fire.

Likewise, internal combustion engines should be housed in non-combustible enclosures. Engines using fuel oil or kerosene are preferable to gasoline-driven equipment, from the standpoints of hazards to life and the possibility of fires and explosions. Gravity fuel supplies should be prohibited; underground tank storage outside of the building is preferable. Where the fuel supply for the engine is received in barrels, care must be exercised in handling it and delivering it into storage, particularly if it is gasoline. The storage supply must always be replenished in daylight hours.

If the plant is operated by a steam engine, all steam pipes passing through woodwork, or exposed to dust accumulations should be insulated. It is advisable to install permanent lighting facilities around all operating machinery in the coaling station, with sufficient illuminating intensity to permit repairs to be made without recourse to lanterns or open-flame torches. Enclosures for cut-outs and automatic-operating devices should be dust tight, but where this provision has not been made the dust should be blown out as frequently as conditions require.

Heating Facilities

Those parts of a coaling station that require heating are generally restricted to the operator's room, the machinery enclosure and, where this type of protection is provided, the dry-pipe automatic-sprinkler valve house. Steam pipes should have a clearance of at least 1 in. from all woodwork; wearing apparel, waste, gloves, etc., should never be placed on steam pipes or above or near stoves. Where electricity is used for heating, the heaters should be of the non-glow type and should be kept free of coal-dust accumulations. Coal stoves should have a clearance of not less than 3 ft. from woodwork; otherwise, the woodwork should be protected with an asbestos-backed metal shield with a space of 1 in. between the shield and the woodwork.

Where a stovepipe passes through

a frame wall or partition, it should be provided with a substantial metal ventilated collar of at least twice the diameter of the stovepipe. The stovepipe should have a clearance of at least 12 in. from woodwork, or the woodwork should be protected by asbestos-backed metal, and the pipe should be braced securely to prevent vibration. A spark cap and arrester should also be provided if conditions warrant. As a further precaution against the possible ignition of inflammable material, torches, lanterns and smoking should be prohibited around wooden coaling stations.

Welding Work Hazardous

Considerable hazard is involved in the use of acetylene and oxygen equipment in coaling stations, particularly those of wood construction. Where such equipment is being used, there is an ever-present danger of igniting coal dust, and in wooden structures there is the added risk that molten metal may fall through cracks or other small openings and lodge at points that are difficult to reach. If it becomes necessary to use such equipment, special care should be exercised when hoisting the cylinders to use the approved method of handling with a cradle, as illustrated in Safe Practices pamphlet No. 25, issued by the National Safety Council.

Before using the welding or cutting equipment, all coal dust should be cleaned away from the area of operation, and this area should be wet down thoroughly both before and after cutting or welding, with careful attention to getting plenty of water into all openings through which molten metal might pass or in which it might lodge. Where practicable, a metal plate should be placed under the area involved in the operation. After the work is finished, a careful examination should be made to insure that no smouldering fire has been left, and it will be well to make an additional inspection later. If the cutting operation is an extensive one, the wetting should be caried on more or less continuously, and an employee other than the operator of the equipment should always be on hand to watch where molten metal falls.

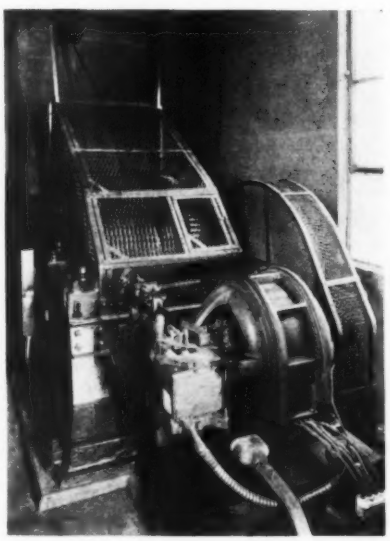
Periodic Cleaning Necessary

Bins should be emptied and cleaned thoroughly at regular intervals, the length of which will depend on the character of the coal assigned to the station. Some coals are more susceptible to spontaneous ignition than others, and where they are handled frequent flushing of the bins is desirable to insure removal of the fine coal that packs in corners, etc. It is also desirable to line the bins with heavy metal plates, as they facilitate emptying and cleaning.

Using fire to thaw coal in cars involves a hazard that should not be ignored. It is preferable not to place fire under a car, but where this is done the receptacles should be placed in front of and back of the hopper door openings, and care should be exercised not to leave the fire under the car too long. The preferable method is to place the cars in heated enclosures for thawing; or to loosen the coal manually. If fires must be used, the receptacles containing the fire should be placed alongside the car.

Not a few coaling stations have been constructed to fuel engines from two sides, but in some cases changes in operating methods or reduced traffic have decreased the demand on certain plants so that only one side is in use. In such cases, if the coal is not removed occasionally from the unused bin the likelihood of fire resulting from spontaneous combustion will be increased.

While improving the appearance of the structure, sheathing boards are not



Motors Should Be Enclosed in a Compartment or Room Constructed of Non-Combustible Material With Free Ventilation to the Outside Atmosphere

essential to its integrity, and unless they are kept in good repair, sparks are likely to enter the concealed spaces between the sheathing and the timbers forming the bins. Larger openings afford entrance for birds to build nests, which increase further the possibility of fire. Wooden coaling stations spanning tracks should be protected from sparks with blast plates of wrought iron or other substantial noncombustible material that will resist fumes from locomotive stacks.

Provision is sometimes made for drying sand in coaling stations, or in frame buildings adjacent thereto or so located as to create an exposure. Stoves used as sand driers should be set on a base of concrete, brick or substantial metal, but care should be exercised where the brick or metal rests on combustible material, to see that provision is made for air circulation through or under it. It may also be desirable to protect woodwork exposed to hot sand with substantial metal. Sand-drying stoves and stove pipes, where adjacent to woodwork, should be treated in the same manner as described for heating stoves. Blowers should not be used when locomotives are under or on tracks adjacent to coaling stations.

Fire Extinguishing Equipment

Assuming that all of these precautions, and others that may be desirable by reason of local conditions, have been taken to prevent the occurrence of fires, our next step is to provide facilities for extinguishing them in the event they do occur. Automatic sprinklers installed in accordance with the Underwriters' requirements are the most reliable and effective means of extinguishing fires in coaling stations. First-aid fire equipment, that is, chemical extinguishers, should also be installed. Where power is derived from electricity or internal-combustion engines, equipment suitable for these hazards should be installed, as well as extinguishers for free-burning materials, such as wood; for the latter purpose, it may be necessary to employ the non-freezing type.

In addition to the foregoing, a 1½-in. hose connection at the top of the structure may be desirable. This should be in the form of a standpipe with connections permitting it to be fed from shop or other pressure mains in the vicinity. Such a pipe should be kept dry, particularly in the winter, or it can be a pipe with a female connection at the bottom to which a fire hose can be attached at the time of a fire, to supply water to the outlet at the top. This line can also be used to wash down the interior of the bins at the time of periodic cleaning.

Outside hydrants are essential for the proper protection of coaling facilities, but should not be placed closer than 50 ft. to the structure. If there is a private fire-alarm system serving the shop area, a fire-alarm box should be placed close to the coaling station. Local conditions will determine whether it is necessary to keep a supply of hose at the fire hydrants, or to depend on the hose that will be brought up by the local fire brigade.

N. & W. Builds Ramp For Unloading Work Equipment

THE unloading of heavy work equipment presents difficulties, which are multiplied where the equipment is moved from place to place frequently, necessitating correspondingly frequent loading and unloading. The handling of such equipment is expensive in many cases, not only from the standpoint of the actual time required with a large number of men to load or unload it, but also because of the time lost in its use, and the expense of assembling ties or blocking material and other preparations for loading or unloading. In addition, the consideration of safety presents important problems in the handling of such equipment.

On the Norfolk & Western, the frequent loading and unloading of its welding outfits, which weigh 6,500 lb., presented problems which were solved by the construction of a demountable rail ramp by means of which three men can load or unload the outfit quickly and safely.

Construction of the Ramp

The ramp consists of two new 50-lb. rails, supported at one end by the floor of the car from which the machine is unloaded, at two intermediate points by built-up and welded steel horses, and at the lower end by the track rails. The upper ends of the ramp rails extend 1 ft. 6 in. into the end of the box car used for shipping the welding machine, and are bolted to the ends of two similar rails within the car, which in turn, are permanently fastened to the car floor, and support the welding machine when it is loaded in the car.

The ramp rails, as they leave the car, curve downward in a smooth vertical curve which was accurately produced by cold-bending the rails at the frog shop. The ends of the ramp rails which rest upon the running rails of the track are planed on the lower side to the proper angle to form a point which rests upon the top of the track rails. At two intermediate points, one 9 ft. and the other 17 ft. 6 in., from the end of the box car, the ramp rails are bolted to two steel horses, which rest upon the track rails.

The steel horses, one 3 ft. 1-15/16 in. high, and the other 1 ft. 7 in. high, consist of rectangular frames of steel "L" members, cross-braced by two steel bars, The horses are 4 ft. 10⅝ in. wide center to center of uprights. The uprights are 3-in. by 3-in. by ⅜-in. angles, and the horizontal members are 2-in. by 2-in. by ¼-in. angles. The steel bars used for cross-bracing are of 1½-in. by ¼-in. section. At the bottom of the uprights on each horse is a short section of 4-in. by 4-in. by ⅜-in. angle welded in place so that one of the 4-in. legs is horizontal and rests upon the ball of the track rail when

Showing the Unloading Ramp Assembled at the End of the Equipment Car

the horse is in place, and the other leg extends downward over the gage side of the rail to prevent side motion of the ramp under load.

Horses Welded

Welded to the top of each upright of the horses at an angle corresponding with the incline of the ramp are steel bearing plates ½-in. thick and 4-in. by 8-in. in area. These plates are drilled with four bolt holes corresponding with four similar holes drilled in the base of the ramp rail, which are used to bolt the ramp rails to the horses.

At the lower end of the ramp where the ramp rails are beveled to rest on the top of the track rails, a 2½-in. by ¾-in. steel bar is bolted between the ramp rails to hold them to gage. The bar is bolted with the long axis of the section vertical, and a lower corner at each end is cut to fit against the gage side of the track rail; thereby preventing any lateral motion of the lower end of the ramp.

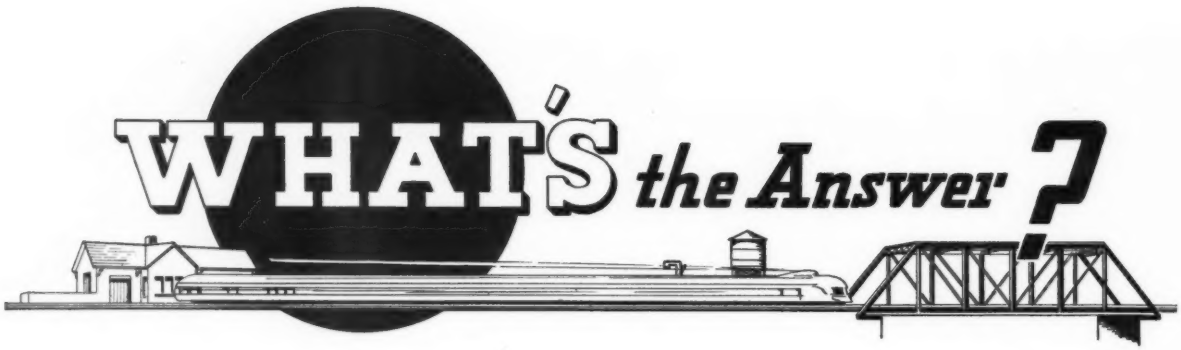
Quickly Assembled

In the process of assembling the ramp, the two ramp rails are taken out of the box car and their upper ends are bolted by means of angle bars and track bolts to the 50-lb. rails secured to the car floor. The steel horses are then set upright across the track rails and are bolted to the base of the ramp rails, and when finally the bar connecting the beveled ends of the ramp rails is bolted in place, the ramp is ready for use. The entire assembly procedure takes approximately 20 minutes.

All the parts of the ramp fit perfectly so that no blocking or adjustment is required. Each unit is light enough to be handled by three men, and requires little space to store in the car. Owing to the large radius of the vertical curve in the rails at the end of the car, machines with small clearance above the rail can be loaded. Since the ramp rails are held accurately to gage and are fastened to the end of the car, there is no possibilty of derailment. Obviously, this ramp can be used for loading air compressors and other maintenance of way equipment mounted on wheels. A similar ramp with a flat car could be used for loading cranes.

The box car which is used for the welding machine is equipped with outward swinging doors at one end. At the other end, mounted inside, is a geared winch with a steel cable which is used for loading and unloading. When the ramp is in place, it can also be used for loading materials or equipment with other than flanged wheels, by laying planks across the rails and upon the end of the car floor, forming an inclined platform up which the material or equipment can be pulled or pushed. The car which houses the welding machine has also been fitted as a repair car for the welding outfit, and is so used on rainy days.

This welded ramp, which was constructed by the railroad company's welding forces, under the direction of R. P. Winton, welding engineer, has proven so satisfactory that two others have been built and are now in regular use on the N. & W.



Mowing the Right of Way

What is the most practical and economical method of mowing the right of way? Does the character of the vegetation or of the ground make any difference?

Mowers Are Best

By Armstrong Chinn
Chief Engineer, Alton, Chicago

For the first 6 to 18 ft. outside of the ballast section, the adjustable type track mower offers the most practical and economical means of cutting vegetation. The machine can be operated at a cost of $1 to $1.50 per swath mile, depending on local conditions and the amount of interference by trains. This is only one-sixth to one-fourth of the cost of doing the same work by hand with scythes. Beyond the reach of track mowers, the right of way can be cut economically with a horse-drawn farm mower. As a rule, local farmers can be hired at a reasonable cost to do this work. In fact, in some sections where the right of way has been mowed regularly and a good grade of grass has grown on it, farmers will mow it for the privilege of gathering the hay.

In recent years, the horse-drawn mower has been displaced in some instances by a wheeled-type of farm tractor equipped with mowing attachments. This mower is quite flexible and can be operated over rough ground. Since it is equipped with rubber tires, it can be run on paved highways, which is often a help in getting it quickly to the points where it is needed.

A certain amount of hand mowing will always be necessary in places that are inaccessible to the mowers, as around poles, roadway signs, road crossings, bridges and fence corners. Mechanized methods of mowing are so much faster and more economical, however, that on most roads that can afford the initial investment to provide the power tools, they have displaced the slower and more costly hand methods.

The foregoing refers to right-of-way that is mowed with reasonable regularity, but not to right of way that has been neglected until brush and small trees have grown up, that must first be cleared with axes and brush hooks before it can be mowed with any type of equipment.

Has Definite Objectives

By C. H. R. Howe
Cost Engineer, Chesapeake & Ohio, Richmond, Va.

The control of vegetation on the right of way has for its purpose certain very definite objectives. Foremost is the keeping of the ballast clear of such growth; second, that of preventing an accumulation of inflammable material in the vicinity of wooden structures; and, third, that of destroying noxious weeds that are harmful to agricultural crops. Arrayed against the detrimental features, about the only benefit obtained from grass and weed growths is that of erosion prevention.

Probably no feature of railway maintenance presents a greater variety of working conditions throughout the country than mowing. Not only must we consider the character of the terrain to be mowed, but climatic conditions and the nature of the different growths must be taken into account. As the general idea of mowing is to secure grass-covered right-of-way, free from rank growths, this can best be done by mowing during the flowering period. Thus the nature of the undesirable growths and the climatic conditions determine the proper time to mow. This question is, therefore, a purely local one.

Formerly, many of the railways

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in September

1. *What details should be given particular attention in the application of joint bars to new rail? Of new bars to old rail? Why?*
2. *Is it practicable to paint concrete surfaces with linseed-oil paints? If not, why? If so, what precautions should be observed?*
3. *To what extent is it practicable to defer the renewal of a certain proportion of ties beyond their normal life, so that renewals can be made in connection with general surfacing? How long?*
4. *What are the causes of failure of waterproofing? What means can be employed to reduce such failures?*
5. *What provision should be made for draining inter-track spaces after the ballast has been cleaned? Why?*
6. *How frequently, and by whom, should water columns be inspected? What details should be given attention?*
7. *What causes track to ride "dead"? What effect does speed or density of traffic have? What should be done to remedy the condition? Why?*
8. *To what extent is it practicable to insulate existing buildings? When should this be done? How? What are the advantages?*

mowed the entire right of way annually, as it was thought desirable to present a neat appearance at all times. From a transportation standpoint, mowing may be considered as non-essential work and, as an item of maintenance labor, it is largely non-productive. During recent years curtailment of maintenance expenses has necessitated radical changes in maintenance practices and, naturally, the non-essentials were the first to be eliminated or modified.

On a number of railways mowing methods have been revised completely. Instead of mowing the entire right of way, these railways now cut a single swath on each side of the track during the flowering season. Late in the fall, when the standing vegetation has dried, the right of way is burned over. In this way, not only is the debris removed, but a great many of the scattered seeds are destroyed.

Methods employed in mowing vary in accordance with the character of the growth to be cut and the equipment available for doing the work. Where the ground is rough and irregular, manual labor with scythes can hardly be avoided, but in some parts of the country where the right of way is more uniform, advantage can be taken of power-operated mowing machines, which are available in both on- and off-track types. When the scope of operation is extensive and high production is obtainable, such machines are much more economical than hand mowing. However, if the time-element factor enters the situation, and the period of possible use is curtailed to the extent of requiring the purchase of a number of machines to complete the mowing within the time limit, the investment should be considered carefully, as with any one-purpose machine.

Two Parts to Problem

By J. C. Patterson
Chief Engineer Maintenance of Way, Erie, Cleveland, Ohio

This problem divides itself naturally into two parts, (1) the roadbed or the land upon which the tracks are constructed, and (2) the right of way beyond this strip. Obviously, the first is the more important, and by the use of spreaders and bulldozers is so shaped that it is possible to mow over it with mowing machines that run on the track, and this is the most economical method. This strip extends at least 11 ft. from the center line on single track and for a similar distance from the center line of the outside tracks on multiple-track lines. The mowing should be done before the seeds ripen.

As for the remainder of the right of way, we find that the most economical method is to clear it off during the winter months. This is done by the section gangs, using scythes and brush hooks. In this way, the gang does productive work during the unproductive season, and the work thus done does not become an out-of-pocket expense.

How Soon to Paint After a Rain

How soon after a rain is it safe to paint a frame building? A steel structure? What determines this interval?

Let the Surfaces Dry

By W. E. Gardner
Principal Assistant Engineer, Wabash, St. Louis, Mo.

Most painting rules require that sufficient time be allowed after a rain for the surface to dry before the paint is applied. There are so many variables to be considered in this connection that a definite or fixed time can not be stated. In the case of old unpainted wood surfaces, or painted surfaces on which the paint has cracked, considerable moisture will be absorbed during a rain, and the surface must be allowed to become practically dry before the paint is applied. In addition to the absorptive qualities of the surface, the orientation of the surface, humidity, wind velocity and temperature all affect the drying time.

In view of all of these variables it will not be good practice to say that painting shall start a certain number of hours after a rain. By observation and touch an experienced painter can judge the dryness of a surface with sufficient accuracy to insure that there will be little danger of paint failure by reason of excess moisture in the wood when it was applied. If the surfaces feel dry to the touch and no water is observed in cracks or joints, there should be no reason to allow more drying time, although the best paint job will obviously be on surfaces that have dried completely.

A paint film applied over a surface that is not sufficiently dry will show definite failure sooner and faster if it is exposed to heat, such as from the direct rays of the sun. Failure of the paint, induced by moisture under the film, almost always manifests itself by blisters that raise and separate the film from the surface, although in some cases flakes of the film will loosen without blistering. The fact that blistering indicates a paint failure by reason of moisture in the wood, does not always mean that the paint was applied to a surface that was not sufficiently dry at the time of application. The trouble may have been caused by seepage of moisture behind the film as a result of structural defects.

Moisture Enemy of Paint

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Moisture is one of the worst enemies paint has, regardless of the type of structure or character of surface to which the paint is applied. The time to be allowed after a rain before it is safe to paint a frame building depends on the drying conditions. If the surface is exposed to the hot sun or a drying wind, the rate of drying will be much faster than in still air or in the shade. If the work is that of repainting a previously painted surface upon which the old paint is still in fair condition and still affords considerable protection, the surface will dry quickly. If, on the other hand, the old paint has failed to the point where it no longer affords protection, the wood may become saturated and require several days before it has dried sufficiently to make it safe to apply the new paint. This will apply with equal force to new frame buildings that have not been painted. Wood is porous and absorbs moisture readily. If the surface is painted before the wood is thoroughly dry this moisture is quite certain to cause the paint to blister and peel off.

It is of equal importance that steel surfaces be thoroughly dry before they are painted. Moisture behind the paint film starts rust and as the rust forms it expands and fractures the paint, leaving the steel exposed to the weather, and thus subjects it to further corrosion. When frost appears, it is better not to paint steel until the heat of the day has removed all signs of frost and dampness. At this time the temperature of the paint

should be as near the temperature of the steel as practicable, to insure a good job. To avoid waste of time and money, do not apply paint to damp surfaces, either steel or wood.

May Be Misleading

By Supervisor of Bridges and Buildings

This question cannot be answered academically, for there are too many variations involved. The essential condition under which the paint should be applied is that the surface must be dry, but even this statement may be misleading, for in not a few cases where wood surfaces are involved, they may be dry when the paint is applied, yet it will fail almost as readily as if they had been damp. If the wood was thoroughly dry and the rain is only a summer shower, the priming coat can be applied within a relatively short time. Any experienced painter will be able to judge how soon in this case.

On the other hand, if the rain has been long continued, the chances are that the wood is at or near the saturation point. If the weather remains cloudy after the rain has ceased or the humidity continues to be high, it may require anywhere from several days to several weeks for the wood to dry out sufficiently to permit painting with safety. If the sky clears, the temperature rises and the humidity is low, surfaces exposed to the sun will dry more rapidly than those that are shaded, and in some cases the former may be painted safely several days in advance of the latter. The foregoing refers primarily to unpainted surfaces and to priming coats.

If the surface has been painted previously and the old paint still retains a high degree of protective value, the interval between the cessation of rain and the instant when the paint can be applied will be much less. But if the old paint has lost much or all of its protective value, the situation will be much the same as if the surface had never been painted.

Wood absorbs moisture readily, but under natural conditions gives it up reluctantly. This is illustrated by the fact that it normally takes from four to six months to season ties and may require as much as 10 months. The surface of wood that has been saturated may appear to be dry when exposed directly to the sun on a hot day, yet the interior may be little below saturation. Under normal conditions of outside exposure, dry wood generally contains from 20 to 25 per cent by weight of water. Even kiln drying does not reduce the moisture content much below this. If the wood contains moisture much above this point, it may affect the paint, causing it to blister and peel. If the surface is damp when the priming coat is applied, the oil cannot penetrate below the surface and the film does not adhere to it. However, if the priming coat had already been applied at the time of the storm, the body or finish coat, as the case may be, can be applied safely as soon as the surface is free from moisture.

How to Remove a Tie

What sequence of operations should be followed in removing a tie for renewal? When inserting the new one? What are the advantages?

Preserve Old Bed

By T. E. McMannis
Supervisor, Central of New Jersey, Somerville, N. J.

Ties used for renewals may be spotted in or inserted in conjunction with the general track-raising program, the method to be followed and the sequence of the individual operations varying somewhat, depending on the manner in which the renewals are made. When ties are spotted in, a typical sequence will be to dig out the ballast in one of the cribs adjacent to the tie, going a little deeper than the bottom of the tie. The spikes are then pulled and the tie is bumped into the cleared crib and removed. Next the bed upon which the old tie rested is reduced to permit the insertion of the new tie, care generally being exercised not to tear up the old bed or to dig into the compacted ballast any deeper than is necessary to permit the replacement tie to be pulled in easily. This should be done with tongs, never with picks or shovels.

After the new tie is in place it should be tamped solidly against the rail before the tie plates are applied or any spiking is done. Next the tie plates should be applied and the tie spiked. The advantage of tamping the tie before the tie plates are applied is that the tendency for the tie to get loose is considerably lessened by the fact that the tie plate offsets some of the settlement that almost invariably occurs in newly tamped ties as the ballast is compacted under traffic. Of course, this method would of necessity have to be modified if for any reason it became necessary to renew a considerable number of ties out of face.

If the ties are being renewed in conjunction with a general raise, the procedure will be, first, to pull the spikes on all ties that are to be renewed. The track should then be jacked up just enough to permit the old ties to be pulled out, then enough ballast is scraped out, without cleaning the crib or disturbing the old bed, to make room for the new ties. The tie plates should be applied at once, the track being gaged and the new ties spiked. If the work is planned properly and the tie renewals are made just ahead of the raising, the final surface will be satisfactory since all ties will have an equal bearing. The advantage of this method is that it reduces the laborious and costly work of digging the ballast from the cribs and thus expedites the installation of the cross ties in the track.

New Ties Deeper Than Old

By Bernard F. McDermott
Roadmaster's Clerk, Chicago & North Western, Redfield, S. D.

I assume that this question refers more particularly to the spotting of ties than to a general overhauling of the track. As the gang works over the track, two men are generally sent ahead to dig the ballast out of the crib adjacent to the tie to be removed. If two consecutive ties need renewal, the crib between them will be chosen, the digging being carried from 1 in. to 2½ in. below the bottom of the old tie, depending on its condition and whether it is deeply rail or plate cut. The spikes are then pulled, the tie plates removed and the tie is shifted into the trench, from which it is pulled out. Lining bars, not sledges, should be used to move the tie off its bed. Ties are not normally taken out until they are in such condition that a blow is likely to shatter considerable wood from them, and this decayed or partly decayed wood is detrimental to the ballast, seldom being scraped out thoroughly. Likewise, for the same reason, tongs should always be used for pulling the tie out. So far as practicable, however, the splinters and other debris should be removed.

Next, the bed on which the old tie

rested must be cut down, because the new tie, if of normal size, will invariably be thicker than the worn tie that it displaces. The bed should not be reduced more than is necessary to permit the new tie to be pulled in with ease. Tongs should be used for pull-in the new tie in, care being exercised to avoid bruising or puncturing the shell of treated wood on the exterior of the tie. Picks, shovels or other sharp instruments should never be used for inserting ties, and the tie should never be struck with a sledge, maul or other tool to shift it, for bruised spots invariably become foci for decay eventually.

Next, the tie should be squared up to lie at right angles to the rails, with one end lined at the correct distance from the line rail. Care should also be exercised to obtain a uniform and level bearing on the old bed. It is important, too, that the heartwood be down, although, where ties are preadzed and prebored this is taken care of automatically. The next operation is the application of the tie plates, after which the tamping is completed. It is generally advisable to nip the tie firmly against the rail while the tamping is in progress. As the final operation, the tie is spiked, it being understood that this includes any gaging that may be necessary. After the track is lined, the ballast should be dressed, this being as important in some respects as any other part of the whole operation. All track that has been worked over during the day should be dressed before the gang quits. It is a sign of slovenly housekeeping to leave open track over night. Furthermore, no maintenance gang knows when it may be called out in an emergency, and if track is left open for any considerable time, it may be necessary to retamp the ties when the regular routine is again resumed.

Plate After Tamping

By W. Woolsey
Section Foreman, Illinois Central, Chicago

When making spot renewals, the spikes should first be pulled from all ties to be removed, the cribs adjacent to these ties should be dug out to slightly below the tie bed and the ties shifted into these trenches with bars. Here the tie plates can be taken off and placed where they will be handy for reapplication. The next move, after a tie has been pulled out, is to level off the old tie bed to conform to the depth or thickness of the new tie; pull the new tie in, tamp it and reapply the plates. This will allow for the settlement that always occurs in newly tamped ties. The tie is now ready for spiking, which should be done in connection with any gaging that may be necessary.

If the track is to be given a general raise, it will not be necessary to clean the cribs, but only to pull the spikes. The tie renewals in this case should precede the surfacing, but the track can be lifted enough to remove the old tie and insert the new one, without disturbing the old bed. The tie plates should be applied at once and this should be followed closely by the gaging and spiking. The track is then ready for the surfacing gang, it being assumed, of course, that any skewed ties have also been straightened before the gaging is done.

What to Do With Fish

Where fish in reservoirs become so numerous as to cause trouble at intakes or interfere with pumping, what means can be employed to remedy the situation?

Use Removable Screen

By K. J. Weir
Special Water Inspector, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Excluding fish from intakes where water is pumped from streams and reservoirs still remains a problem, especially during periods of low water. When intake wells are constructed, they should be provided with adequate screening facilities to exclude twigs, leaves and other floating debris, as well as fish. Periodical cleaning will be necessary, whether trash or fish cause the trouble.

A desirable plan is to construct the screen on the outside of the intake wall in such manner that it can be removed, cleaned and replaced with minimum effort. Immediately behind this screen, on the inside wall, a suitable sluice gate should be provided, which can be closed while the screen is being cleaned. Flexible intake pipes, which can be raised or lowered with fluctuating water levels, should also have screen protection at the intake end. Salvaged well screens that are no longer suitable for use in wells, make excellent screens under certain circumstances. Automatically cleaned screens are available, but usually are too costly to warrant use.

Sometimes a Real Problem

By Supervisor of Water Service

It is generally desirable to stock reservoirs with fish, but under favorable conditions they may multiply until they become sufficiently numerous to constitute a real nuisance so far as pumping is concerned. Streams in which the water is suitable for boiler purposes usually contain fish naturally, and the number may be increased through the stocking that is done by the conservation departments of most states. At low stages, the fish in streams may give as much trouble as in an overstocked reservoir.

It is always possible to reduce the population in a reservoir by means of explosives or the administration of poison, but it is rarely desirable to do so. When stocking a reservoir it is wise to insist that only the more desirable species of food or game fish be liberated. Undesirable species have only a nuisance value and, once established cannot be gotten rid of except by methods that will also destroy the desirable species.

In some cases, opening the reservoir to anglers at certain seasons, under strict supervision, may keep the population of the reservoir within bounds. This should be done with considerable caution, however, for this is a privilege that is likely to be abused, and the right thus given is difficult to control. I recall a case of this kind where it eventually became necessary to make a number of arrests before trespassing that was highly detrimental to the water supply could be broken up.

If a reservoir has been stocked with desirable species of fish that become too numerous, the state conservation department will generally be glad to clear it of the surplus and transfer the fish to other waters. This is usually a desirable arrangement, for in this way trespassing is avoided and no question will arise concerning the destruction or disposition of the fish. Obviously, arrangements of this kind are not possible with respect to streams.

Even where the water is not over populated with fish, trouble may be experienced because they enter the intakes and get into the suction lines, eventually clogging the pump valves and thus interfering with pumping. The larger fish can be kept out of intakes, generally without much trouble, and therefore out of suction lines. It is the smaller sizes that usually

give trouble. The intake well should have two chambers, the water passing into the first from the stream or reservoir through a screen of large area. From this compartment it enters the second through a sluice and screen having a smaller mesh. Both screens should be so designed that they can be removed for cleaning. The one between the two compartments of the intake well should be placed at the entering end of the sluice, which should be fitted with a gate that can be closed while the screen is being cleaned. If the water enters the first compartment through an intake pipe, it may be desirable to eliminate the first screen or it can be constructed to enclose the inner end of the intake pipe. If trouble is still experienced with small fry that can pass the screens, it may be beneficial to attach a well screen of the proper length to the end of the suction pipe.

Pointing Old Stone Masonry

What methods should be employed and what precautions should be observed if one is to obtain satisfactory results from the pointing of old stone masonry?

Clean Joints Deep

By G. A. Haggander
Assistant Chief Engineer, Chicago, Burlington & Quincy, Chicago

It is important that all stone be sound and that all necessary repairs to the substructure be made before the pointing is started, because vibration of the individual stones will cause the joints to crack again. Some early masonry was laid in lime mortar, and this has become soft and partly disintegrated. If this is the case, the mortar should be cleaned out to as great a depth as practicable before the joints are pointed. In other cases, stones have pulled apart from their natural beds, causing the joints to crack. This may have resulted from either vibration or settlement. Before pointing, these stones should be well tied together with metal dowels or clamps.

Another case is where individual stones have disintegrated. These should be chiseled out to a considerable depth, depending on the size of the opening thus formed and the number of stones to be cut out. Anchor bolts should then be inserted and the cavity filled with well-compacted concrete. After these repairs have been made, the joints must be raked out, the amount depending on the thickness of the joint, ordinarily about 2 in. All loose matter should be blown or washed out and the masonry wet down before the pointing is started. The mortar must be thoroughly retempered before using. It should be allowed to stand and be worked at intervals for about 45 min. after mixing, to take up as much shrinkage as possible. In placing, it must be rammed thoroughly into place, with special tools that are used by masons for this purpose.

After the mortar is placed, care must be exercised to insure that it does not dry out too rapidly. To prevent too rapid drying it may be necessary in warm weather to hang a cloth over the wall and keep it wet.

Many Masonry Structures

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Popular Bluff, Mo.

We still have a large number of old stone masonry structures, principally box culverts and arches that have now been in use for more than 85 years, and are still giving satisfactory service despite the marked increase in the weight of locomotives and cars. The present good condition of these structures is not the result of chance, for they have been well maintained by pointing joints and by keeping drain holes working freely to eliminate damage from frost action.

To do a successful job of pointing, one should clean seam joints thoroughly, removing loose mortar and accumulated dirt and dust that have worked through from the outside. In many cases it is necessary to use a hose and water under 30 to 40 lb. of pressure to wash out material that cannot be removed by brushes or pointing tools.

The pointing should follow closely behind the cleaning of the joints to prevent widening of the openings by vibration. The utmost precautions should be observed in applying the cement mortar. If used alone, it should be allowed to stand and be reworked from time to time to overcome shrinkage. Better results can be obtained, however, by adding a small amount of non-shrinking material, which is available from several manufacturers. In many cases we have found it necessary to drill new or additional drain holes to prevent water from flowing between the joints of the old masonry, thus inducing damage from frost action.

Storing Winter Equipment

How and by whom should storm windows, stoves and similar winter equipment at stations be stored? Why?

Eliminate Damage

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Popular Bluff, Mo.

When removing winter equipment such as that mentioned in the question, every precaution should be taken to eliminate damage. A broken glass or muntin in a storm window may seem to be of small moment, but the replacement of a pane of glass may necessitate a full day's time of a glazier, with the possibility of having to pay overtime, making the cost almost prohibitive, while the cost of repairing damage to the sash may be as great as that of a new one. Storm doors and windows should be repaired when they are taken down and should be numbered, to permit them to be set in place without delay when they are again needed. This will also reduce the chance of breakage.

When they are stored, doors and windows should be laid with strips between the sections, to avoid their warping or getting out of line while not in use. They should be stored in places provided for this purpose, preferably in the building to which they belong, usually in baggage rooms, attics or regular storage rooms at the larger stations.

It is our practice to have a regular man assigned to handle all winter equipment, that is, take it down and see that it is put in proper condition for reuse in the spring; and to apply it in the fall shortly before cold weather. This work is generally assigned to a traveling mechanic who looks after the equipment at all points where a regular building gang is not located. The same practice is fol-

lowed in setting up and removing door and window screens, which are stored during the winter in the same manner as the winter equipment is in the summer.

It is not considered economical to remove heating stoves and stove pipes from small buildings, for the reason that they may be more or less damaged in handling, and there is generally little probability of their being damaged if left in place for the summer. There is, therefore, little incentive to incur the cost of their removal and replacement. However, stoves and stove pipes should be painted or polished as soon as the need for them is over, and they should be repaired and left in condition for immediate use when required.

Worth Serious Study

By General Building Inspector

At first glance, this seems to be a somewhat useless question; yet when one considers the matter it becomes apparent that a great deal of waste can occur where many stations are equipped with storm windows and storm doors, unless the operations of applying and removing them are properly organized and supervised. I believe, therefore, that the subject is one that warrants serious study. I would have included window and door screens in the question, however, for they present substantially the same problem.

Checking up on the methods that are being followed, I find a diversity of practices on different divisions, ranging from a few cases at the larger stations where the janitors take the equipment down in the spring and store it, putting it up again in the fall, and calling on the building forces only when repairs are needed, to the assignment of one or two men whose duty it is to take the equipment down, make necessary repairs, paint it and store it, replacing it again before winter.

Obviously, care must be exercised to prevent damage, for such equipment can be damaged easily. Dropping a sash is quite likely to break all of the glass and may damage the sash as well, requiring complete replacement. While doors and vestibule panels are not so easily damaged as sash, carelessness in handling may cause considerable damage, the cost of repairing which may be out of proportion to the value of the equipment.

Sash and vestibule panels may be easily warped or made out of square unless care is exercised to store them properly. The panels and doors should be laid flat, with 1-in. strips between each layer. It will be better if the sash are stored in the same manner, although they may be set vertically if this can be done with assurance that they will not be disturbed.

Back of all of these precautions is the desirability of systematizing the work and of doing it under proper supervision. Only in this way can the division officers know that the equipment is being removed and replaced at the proper times, and that it is being maintained as it should be. Again, responsibility can be placed for laxity in methods of storage and undesirable practices can be corrected currently by the local officers responsible.

How Much to Raise Track

When track is to be given a general surfacing, how should one determine the amount of lift required? Does the kind of ballast make any difference?

Generally Two Reasons

By T. M. Pittman
Division Engineer, Illinois Central, Water Valley, Miss.

In general, there are two reasons for giving the track a general surface: (1) in connection with a reballasting program, primarily to increase the depth of the ballast section, although in some cases it may also be desired to replace foul or unsatisfactory ballast as well as to increase the depth; and (2) to facilitate tie renewals and restore the track to a smooth surface by providing a fresh and uniform bed for the ties. It is apparent, therefore, that the amount of lift required will depend on the primary reason for surfacing the track.

In the first instance, the amount of lift will depend on the depth of the ballast section that is wanted. Usually such a program carries with it the strengthening of the subgrade to insure the stabilization of the roadbed and the deeper and wider ballast section, the major factor being the depth of the ballast considered necessary to distribute train loads over the subgrade. For this purpose, the lift may vary from 6 to 12 in., or even more, and the character of the ballast will have no bearing on the amount of lift, assuming of course that a suitable grade of ballast is to be used.

In the second instance, it is assumed that the depth of the ballast already in service is adequate to distribute the load and that the material is clean enough to provide satisfactory drainage. Under these circumstances it is preferable to lift the track as little as the purpose of making the raise will permit. In this case, the smaller the lift the better the track will ride after it has been surfaced. The amount of the lift will depend, therefore, primarily on the size of the ballast, but should not be less than 1½ in., since it will be difficult to tamp all the way across the ties if a smaller lift is made, besides which the renewal of the ties, straightening them and readjusting the tie plates will be slowed down.

Where the profile of the track is irregular, it will be desirable to run the surface to the high points, raising the sags to conform to the general surface. If this is done, the lift will not be uniform, and will be controlled entirely by local conditions. The minimum lift on the high points should be approximately 1½ times the size of the ballast, while the lift in the sags will be controlled, in part at least, by the width of the subgrade. Obviously, it is undesirable to make a high lift where the subgrade is narrow, because of the tendency of the ballast to roll out from under the ends of the ties and cause center-bound track. Furthermore, considerable ballast goes to waste when it is unloaded on a narrow roadbed. Except as the size of the ballast may have some influence, the kind of ballast will have no effect on the amount of lift required, assuming always that the material meets the general requirements for good ballast.

Requires Careful Study

By L. B. Holt
Engineer of Track, New York Central, Cleveland, Ohio

General surfacing requires that the ties shall be raised off the old ballast bed, and that a reasonable quantity of new ballast be tamped under each tie. As a rule, the minimum raise in general surfacing to accomplish this result is 1½ in., although this will vary somewhat, depending on the size of the ballast used. A minimum raise of 1½ in. can be made on stone or crushed slag that ranges in size from that which will pass through a 2½ in. ring and be retained on a 1 in. ring. If well-graded, crushed and screened gravel is employed, the minimum

raise sometimes may be as little as 1 in.

Careful study must be made of the track to determine the amount of lift required and, obviously, this should be done before starting a program of general surfacing. Levels should be taken on top of the rail and a profile prepared, with sufficient vertical amplification to magnify irregularities of the surface. The profile should show the location and elevation of open deck bridges, highway and street crossings, station platforms and other points where the elevation is fixed. The clearance of overhead structures must be recorded on the profile and, on multiple-track lines, sufficient levels must be taken on the adjacent tracks to guide the engineer in determining the ballast grade line that is to be followed.

Study must also be made of the depth of the existing ballast under the ties. If this is sufficient to give an adequate distribution of the train loads to the subgrade, the general-surfacing lift can be kept down to approximately the minimum requirement, varying therefrom only to smooth out surface irregularities. However, where an additional depth of ballast is desirable, the minimum lift can be increased to 3 in. or as much more as may be considered necessary.

Survey should also be made of the shoulders of the roadbed, all places being recorded where they are narrow or low with respect to the proposed ballast grade line, and these should be raised and widened, employing free-draining material for this purpose. If the old ballast is quite foul, the cribs should be stripped and the ballast on the shoulders and between tracks should be cleaned with machines. Furthermore, if water pockets are present in the roadbed, they should be drained by installing pipe, tile, French drains or other of the several means that have proved to be satisfactory for this purpose.

When the minimum depth of ballast is to be applied in connection with the general surfacing program, this means, obviously, that where there are low spots or sags, additional ballast will be applied to bring them up to the general surface. It is also usually necessary to adjust the ballast grade to fixed structures, such as bridges, station platforms, highway crossings and overhead structures. At such points care must be exercised to avoid undesirable dips in the grade line. At places such as those just mentioned, it may become necessary to dig the old ballast from under the ties to permit putting the minimum depth of new clean ballast under them. When such action is taken, care has to be exercised to see that all of the old foul ballast is either screened or replaced with fresh ballast.

Overcoming Mill Tolerances

When laying rail, what methods can be employed to overcome variations in the end height that result from mill tolerances?

Difference May Be 3/64 In.

By C. W. Baldridge
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

The specifications for open-hearth steel rails, as shown in the Manual of the American Railway Engineering Association, provide that the "section of rails shall conform as accurately as possible to the templates or drawings furnished by the purchaser. A variation of 1/64 in. less or 1/32 in. greater than the specified height will be permitted." This permits a difference of 3/64 in. in the height of adjacent rails. However, the two extremes of rail height rarely come together in the track, and even if they do, it is less often that the two rails will match up in such a manner that the entire difference in height will be brought to the tops of the rails.

The reason for this is that with most of the designs of joint bars now in use, the adjacent rails line up on the under side of the heads of the rails, in contact with the tops of the joint bars, thus bringing to the tops of the rails only such difference as exists in the depths of the rail heads, the remaining difference necessarily going to the bottom. That part of the uneven height which comes to the top when the rails are laid can be taken care of readily by grinding the top of the high rail to produce a runoff from the lower to the higher elevation.

In cases where the difference in height goes to the bottom of the rails, no correction of this bottom difference is needed if a suspended joint is used. If a supported joint is used, particularly where a base plate is provided, the entire load passing over the joint must be carried by the bottom of the highest rail until wear or bending of the bars brings the bottoms of the adjacent rails to the same level. When this occurs, the entire difference in height must be at the top of the rails and again it must be taken care of by grinding a runoff in the high rail or by building up the low one by welding. Building up the low rail is generally to be preferred, provided the weld is finished to a true surface by grinding.

Mill Tolerance Necessary

By District Engineer

Mill tolerances of 1/64 in. under and 1/32 in. over the specified height of the rail are allowed by the A.R.E.A. specifications, which are used almost universally for the production of open-hearth rail. To keep within this permitted tolerance over the height, however, it is necessary to dress the intermediate and finishing rolls after about every 1,500 tons of rails are rolled, and these rolls are completely worn out after producing about 25,000 tons of rails. It is evident, therefore, that any greater restriction in this tolerance over the specified height would tend to increase the cost of production, and thus of the price of the rails.

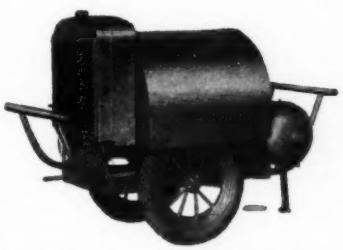
When the rolls are new or freshly dressed, the height of the rail will be at the minimum, and when they are worn to the limit the height will be at the maximum. Obviously, therefore, the extreme difference in height will occur only once in about every 1,500 tons, and the differences in the heights of the successive rails in each 1,500-ton lot, as they come from the rolls, will be too small to detect. For these reasons, it seldom occurs that a rail of maximum height abuts against one of minimum height in the track, although because of the manner in which rails are distributed for use, detectable differences in height do occur between abutting rails.

As the rails are coupled in the track, the difference in the elevation of the running surfaces of the abutting rails is usually less than the actual difference in the height of the rails, because the joint bars bring the fishing surfaces under the head into line when the bolts are tightened, so that the apparent difference in height indicates only the difference in the depth of the heads. Where such differences do occur, the only remedy is to use a surface grinder at the end of the high rail, grinding a run-off to the low rail, but being careful to make the slope long enough so that there will be no possibility of causing a jump of the wheels of fast trains.

PRODUCTS of Manufacturers

I-R Develops Spot-Tamper Unit

A PORTABLE air compressor specially designed for use in connection with spot-tamping work has been placed on the market by the Ingersoll-Rand Company, New York. Known as the Model 55 spot tamper, the new unit consists of a three-cylinder, single-stage, 3¾-in. by 4-in. compressor, direct-connected to a Waukesha four-cylinder, 3¼-in. by 4-in. water-cooled gasoline engine. This compressor has a capacity of 55 cu. ft. of free air per min. at a pressure of 80-lb per sq. in., and is said to be capable of operating two MT-1 or MT-2 tie tampers or four MT-3 tamping tools. It is, of course, adapted to the operation of a wide variety of other types of pneumatic equipment used in track work as well as elsewhere.



The New Ingersoll-Rand Spot-Tamper Compressor

The compressor and engine, together with the air receiver and fuel tank, are mounted in a chassis that is fitted with end rollers but which may be mounted on either pneumatic or plain steel wheels. If the roller arrangement is preferable the wheels may be readily removed. Handle bars are provided at both the front and rear of the chassis, those at the front end being removable. A housing that fits over the engine and the compressor is provided, which may be locked in place in such a manner as to prevent theft of the wheels.

The net weight of the spot tamper with the roller mounting is 910 lb. and with the wheel mounting 970 lb. The length, including the rear handle bar, is 5 ft. 4 in., the height with pneumatic-tired wheels is 4 ft., and the over-all width is 2 ft. 8½ in. To convert the compressor into an "on-track" unit, a dolly car mounted on four flanged wheels is provided. This car, which is of all-steel construction and weighs 360 lb., has a low platform with depressions for the wheels and a clamping arrangement for holding the compressor in place.

New Caterpillar R2 Tractor

A 25-hp. tractor, the R2, has been developed by the Caterpillar Tractor Company, Peoria, Ill., for use in ditching, bulldozing, mowing, spotting cars, embankment construction, hauling off-track maintenance equipment, work around repair yards, and other railway operations. This tractor has a four cylinder, spark ignition, water cooled engine with high compression for burning gasoline, or with moderate compression for using various grades of tractor fuels. The engine, which operates at 1,525 r.p.m., has a cylinder bore of 3¾-in. and a stroke of 5-in. It has a five-bearing crankshaft and removable cylinder liners which are made of a special chrome nickel cast iron.

The carburetor on both the gasoline and tractor fuel models is equipped with an economizing device which automatically reduces the fuel supply when idling or pulling light loads. Controlled heat is provided by passing the proper amount of exhaust gases around the intake manifold, and positive flow of fuel, regardless of the operating angle, is insured by a specially designed fuel pump with a removable sediment bowl. Force feed lubrication is provided by an oil pump driven by the camshaft, and an auxiliary oil pump returns the oil through an oil suction bell from the front of the crankcase pan to the main sump.

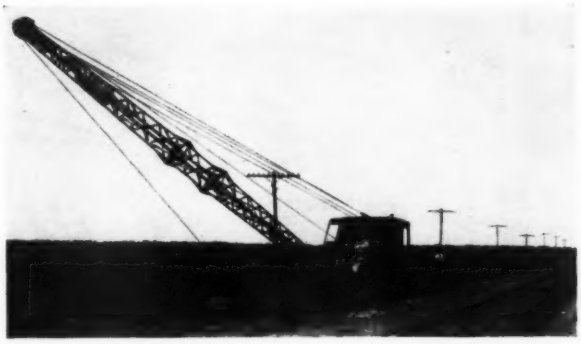
The tractor is provided with five forward speeds of 1.7, 2.5, 3.0, 3.6 and 5.1 miles per hour and the drawbar pull in low speed gear is 5,960 lb. The master clutch is hand-operated and a pedal-operated brake is provided for each of the steering clutch drums to stop the tractor and to permit pivoting on either track. One of the brakes is provided with a rachet to hold the tractor on grades. The final drive gears are protected from dust and mud by automatic, self-lubricating seals that require no adjustment.

The tractor is built in two widths, a 40-in. gage that has an over-all width of 4-ft. 7¾-in., and a 50-in. gage with an over-all width of 5-ft.

Showing the R2 Being Used in Grading Work

5¾-in. Its shipping weight for these two gages is 6,230 lb. and 6,350 lb. respectively. The standard tracks are 12-in. wide, but 20-in. shoes can be installed on the wide gage tractor; rubber track plates are also available. The R2 equipped with standard 12-in. tracks has more than 9 sq. ft. of ground contact.

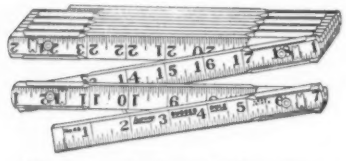
The tracks are of the built-up type, composed of rolled steel shoes attached to forged, heat-treated steel links by heat-treated steel bolts. The track rollers are of the live shaft type, with a large space in the hollow shaft for a lubricant reservoir.



A Lima Paymaster Equipped as a Dragline, Doing Ditching and Embankment Widening Work

Lufkin Rugged Rule

A SIX-FOOT extra-sturdy folding wood rule, designed to overcome the common complaint that such rules break easily, has been developed by the Lufkin Rule Company, Saginaw, Mich. The new rule, known as



The New Six-Foot Folding Rule

Rugged Rule No. 46, is made of tough hardwood sections ⅛-in. thick with smooth-working, brass plated spring joints and brass strike plates to prevent wear of sections in opening and closing. The spring joints have patented locks and the six-inch hardwood sections have a special, light finish of boxwood color so the black markings can be easily read. The rule is marked with a distinguishing bright red stripe down the center of each end.

Lima Convertible Shovel-Dragline-Crane

THE Lima Locomotive Works, Inc., Lima, Ohio, has developed a new convertible shovel, dragline and crane, known as the Paymaster, which is adapted especially to railroad work.

The Paymaster, when used as a shovel, has a ¾-yard bucket and weighs 35,500 lb.; when equipped as a crane, it weighs 34,500 lb. and has a capacity of 11 tons; and when equipped as a dragline it weighs 36,800 lb. and the capacity varies, depending upon the length of the boom. The standard crane boom for the Paymaster is 35 ft., but inserts can be added to make a 50 ft. boom.

A special feature of the design of this shovel is the fact that weight has been kept to a minimum without sacrificing strength or lifting capacity, by the use of high tensile steel with modern welding construction and by placing most of the machinery at the extreme rear of the rotating frame. The machine revolves around a pintle cast integral with the base casting, and the double flange roller path is also an integral part of the base casting. Four cone rollers of the hook type operate in the roller path. The rotating base is a one-piece casting with machinery supports mounted with finished bolts and spot-welded.

Anti-friction bearings are used at all important bearing points, including the drums. The drum shaft is of alloy steel, heat treated and ground to size, and is mounted on self-aligning roller bearings. This shaft carries the two grooved drums which are also mounted on anti-friction bearings. It is claimed that this type of construction will hold the drums concentric with the shaft indefinitely. The main clutches are of the internal expanding-band type, of ample width and with large diameters, balanced to permit instant response to the operating controls. The swing and travel clutches are of the double cone friction type and are amply ventilated.

The crawler treads standard for this machine are 22 in. wide, but treads 30 in. wide can be furnished. the treads have six-point connections and the overall clearance of the trucks is 8 ft. 6 in. which makes it possible for the Paymaster to work on flat cars. Special trucks can be ordered providing an overall width of only 8 ft. A lock is provided for locking both crawlers while digging.

The boom is 18 ft. long, of all-steel box type construction welded throughout, and the dipper handle is 15 ft. long, made of a single seamless tube 7 in. in diameter with a single rack welded the entire length of the handle. The boom hoist is independent and claimed to be exceptionally fast. A chain or cable crowd can also be furnished with this shovel. The power take-off consists of a multiple roller chain operating in a bath of oil.

All control levers are within the cab and are of short easy throw, and the cab is constructed with a built-in winter front designed to provide good vision for the operator at any angle. Two-thirds of the side wall area of the cab can be opened for ventilation in hot weather, and the compact design and arrangement of the machinery make every part readily accessible from the inside of the cab.

Glazecoat Method of Color-finishing Concrete

A NEW method of color-finishing concrete floors, based on recent developments in the field of synthetic resins and named Glazecoat, has been developed by the Master Builders Company, Cleveland, Ohio. In the application of Glazecoat, concrete floors are first thoroughly cleaned and, if necessary, washed with tri-sodium phosphate. The floor is then acid-etched with a 10 per cent solution of muriatic acid, rinsed and allowed to dry. After the floor is dry, Glazecoat stain is applied with a scrub brush and allowed 15 to 30 min. to dry. The Glazecoat finish is then applied with a soft brush, allowed to dry and polished, producing a glossy non-slip floor of the desired color.

It is stated that floors finished in this manner have a durability under traffic wear four to six times as great as painted floors, that this finish can be applied to floors where ordinary coatings will not adhere or prove serviceable, such as floors subject to dampness, and that the Glazecoat finish involves less time and inconvenience for application than an ordinary paint finish. The Glazecoat stain is available in 13 colors and one gallon of stain covers approximately 500 sq. ft. of surface. One gallon of Glazecoat finish covers approximately 1000 sq. ft.

NEWS of the Month

David J. Lewis Nominated on National Mediation Board

President Roosevelt on May 24 nominated David J. Lewis, former congressman from Maryland, to the National Mediation Board for a term expiring in February, 1940, to succeed Dr. William M. Leiserson, who was recently transferred to the National Labor Relations Board.

City of Denver Completes Three Years Service

On June 18 the City of Denver streamliners of the Union Pacific and the Chicago & North Western completed three years service, or 1,095 trips between Chicago and Denver, Colo., for a total of 1,147,029 miles. During this period the trains have never been in the shop, maintenance work having been accomplished at the end of each trip.

Roosevelt Suggests Rail Equipment Fund

As a part of the plan which he suggested on June 22 for a $3,060,000,000 revolving fund for self-liquidating projects to be spent over the next seven years, President Roosevelt included $500,000,000 for railway equipment to be acquired over a three-year period by a government agency from which the carriers could lease the equipment with an option to buy at a later date.

Net Operating Income Increases

In the first four months of 1939, Class I railroads of the United States had a net operating income of $101,066,278, as compared to $29,360,310 in the same period of 1938. This represented a return on the investment of 1.55 per cent this year, as contrasted with 0.45 per cent in 1938. In 1930, the net operating income for the first four months was $233,942,444, representing a return of 3.51 per cent.

Illinois Central Uses Motor Trucks for L.C.L. Freight

Beginning June 27, the Illinois Central inaugurated a system of daily L.C.L. freight delivery by motor trucks in the area bounded by Centralia, Ill., on the north, Eldorado on the east, Cairo on the south and East St. Louis on the west. Under this plan, merchandise destined to any one of the 66 Illinois Central freight stations in this area will be moved in carloads to Carbondale, Ill. Evening shipments from Chicago will arrive on a fast train at 2:50 a.m. and from St. Louis shortly after midnight. Immediately upon arrival at Carbondale, the contents of the freight cars will be loaded into waiting motor trucks, rented from the Railway Express Agency, and by 5:30 a.m. the trucks will be under way to make deliveries to Illinois Central local freight stations. In the afternoon the trucks will reverse their routes, returning to Carbondale for evening connections with fast freight trains in all directions. By this plan merchandise service will be improved by reducing time in transit by as much as 48 hours in some instances, and local freight carload service will also be improved.

Eastern Roads Reduce Fares

Effective July 1, the Eastern railroads put into effect reduced round-trip coach and pullman fares based on a sliding scale of the distance traveled, and also a flat reduction to 2.7 cents per mile for one-way rail tickets good in upper berths in Pullman travel. Under the new scale of round-trip fares, tickets valid in coaches are sold for distances up to 100 miles on the basis of 2.25 cents per mile. The rate diminishes progressively by 50-mile blocks until a minimum of 1.7 cents per mile is reached at the distance of 901 miles and over. Round-trip tickets valid in Pullman lower berths, parlor cars or other forms of non-coach accommodation have also been scaled down from the former 3-cents-per-mile rate to a minimum of 2.7 cents per mile, a reduction of 10 per cent. The new round-trip coach fares, applicable to the longer distances, represent a reduction of 32 per cent.

Robert H. Ford Given Honorary Degree

An honorary degree of Doctor of Engineering was conferred upon Robert H. Ford, chief engineer of the Chicago, Rock Island & Pacific, by Norwich University at Northfield, Vt., on June 12. The degree was conferred for "outstanding work in the field of engineering." Mr. Ford is a graduate of Norwich University and a member of its board of trustees. He has been chief engineer of the Rock Island since April 11, 1937, and is a past president of the American Railway Engineering Association.

B. & O. Employees Bring Million a Year in Business

During the first five years of the Baltimore & Ohio's Co-operative Traffic Program, between November, 1933 and November, 1938, according to O. S. Lewis, general freight traffic manager, the participants in the program secured a total of 108,037 carload shipments, 95,877 less-carload shipments and 167,062 passengers. It is estimated that the gross revenue brought to the road by this business was about $5,400,000 averaging over $1,000,000 per year.

Judge Orders Wage Cut on the Rutland

On June 17, Judge Harland B. Howe of the U. S. district court for Vermont issued a decision ordering L. G. Morphy, the receiver of the Rutland, to reduce wages of employees from 10 to 30 per cent, based upon a sliding scale of the weekly wage in effect prior to July 12, 1938. The decision was rendered at the request of L. G. Morphy, who, tiring at delays by the National Mediation Board, stated in his petition "continued operation without a reduction in wages will result in increasing greatly the debts of your petitioner which can be paid, if at all, only by discontinuing operations and selling the railroad as junk."

N. & W. Wins Harriman Safety Medal

On June 20 at a luncheon at the Yale Club, New York, the Norfolk & Western received the gold medal E. W. Harriman award for the best 1938 safety performance among the larger railroads. The silver medal for the best showing in that year among railroads operating between one and ten million locomotive-miles was won by the Duluth, Missabe & Iron Range, and the bronze medal for roads operating less than one million locomotive miles was bestowed upon the Lake Superior & Ishpeming. As stipulated in the plan of the award, the awards were determined on the basis of the official records and summaries of the Interstate Commerce Commission. In the case of the Norfolk & Western, passenger casualties in proportion to passenger miles had been reduced 86 per cent in 1938 as compared to the years 1923-1925 and employee casualties in proportion to employee hours had been reduced 84 per cent for 1938, as compared to the same years. The Duluth, Missabe & Iron Range did not report a single casualty to passengers, trespassers or at grade crossings in 1938 and only two minor employee injuries were sustained on that road during the year. The Lake Superior & Ishpeming has operated for seven consecutive years without an employee fatality—neither this road nor the D. M. & I. R. has ever killed a passenger.

Personal Mention

General

D. C. Gough, roadmaster of the Clearwater subdivision of the British Columbia district of the Canadian National, has been appointed acting transportation assistant of the Vancouver Island Lines.

H. G. Wood, roadmaster on the Atchison, Tapeka & Santa Fe at Chillicothe, Ill., has been promoted to transportation inspector for the Eastern division, with headquarters at Topeka, Kan.

James C. Crombie, assistant engineer in the department of research and development of the Canadian National at Montreal, Que., has been promoted to assistant superintendent at Brandon, Man. Mr. Crombie was born at Chatham, Ont., on January 24, 1905, and attended McGill University and Nova Scotia Technical College, graduating in mechanical engineering in 1928. He entered railway service on the Canadian National in the summer of 1920, and worked summers until the summer of 1927, when he worked for the Canadian Car and Foundry Company. After graduation from college he became a draftsman for the Dominion Engineering Company and on April 1, 1929, he re-entered the service of the Canadian National as an assistant engineer in the Bureau of Economics at Montreal, which was later changed to the department of research and development.

Fred C. Paulsen, superintendent of the Idaho division of the Union Pacific, with headquarters at Pocatello, Idaho, and an engineer by training and experience, has been promoted to general superintendent of the South-Central district, with the same headquarters. Mr. Paulsen was born at Omaha, Neb., and entered the service of the Union Pacific in May, 1903, as a shop messenger in the mechanical department, later being transferred to the

Fred C. Paulsen

engineering department, where he served as a rodman, instrumentman, draftsman, assistant engineer, office engineer and roadmaster at Manhattan, Kan., and division engineer at Cheyenne, Wyo. In 1926, Mr. Paulsen was promoted to assistant superintendent, with headquarters at Pocatello, Idaho, and in 1936 he was promoted to superintendent, with the same headquarters.

H. C. Murphy, an engineer by training and experience, whose promotion to assistant vice-president of the Chicago, Burlington & Quincy, with headquarters at Chicago, was announced in the June issue, was born at Canton, Ill., on August 27, 1892, and received his higher education at Iowa State College, Ames, Iowa, and at the Armour Institute of Technology, Chicago. His first railway service during the early years of his career was with the Minneapolis & St. Louis, and he also engaged in municipal and highway engineering work in Iowa. He entered the service of the Burlington on July 13, 1914, as a clerk in the auditor's office at Chicago, later entering the engineering department as a rodman at La Crosse, Wis. During the winter of 1915-16, he continued his studies at Ames, then returning to the Burlington as an instrumentman at Chicago. During the war he served as a pilot in the United States Army Air Service, returning to the Bur-

H. C. Murphy

lington in 1919 as an assistant engineer at Centralia, Ill., later holding the positions of acting division engineer at Centralia, division engineer at Kansas City, Mo., and division engineer and roadmaster at the latter point. In August, 1923, Mr. Murphy was appointed assistant engineer maintenance of way at Alliance, Neb., and in April of the following year he was appointed district engineer maintenance of way at Galesburg, Ill. In February, 1925, he was sent to Lincoln, Neb., as engineer maintenance of way and after two years in this position he was appointed transportation assistant to the general manager, Lines West, at Omaha, Neb., being transferred to Chicago in October, 1928. In April, 1929, Mr. Murphy was appointed superintendent and served in this capacity and as assistant superintendent at various points until August, 1933, when he was appointed superintendent of safety, with headquarters at Chicago. On May 1, 1936, he was promoted to assistant to the executive vice-president and a few months later he was elected also president of the Burlington Transportation Company, a bus subsidiary. Mr. Murphy held these positions until his recent promotion.

Donald J. Russell, assistant to the general manager of the Southern Pacific, with headquarters at San Francisco, Cal., and an engineer by training and experience, has been promoted to superintend-

Donald J. Russell

ent of the Los Angeles division, with headquarters at Los Angeles, Cal. Mr. Russell began railway service in 1920 as an assistant foreman of an extra gang on the Sacramento division of the Southern Pacific and later became a section foreman, instrumentman and assistant engineer in the maintenance of way department and on construction work. In 1927, he was appointed roadmaster on the Portland division, with headquarters at Oakridge, Ore., and in 1928, he was promoted to assistant trainmaster. A year later Mr. Russell was advanced to trainmaster and in August, 1934, he was promoted to assistant superintendent of the Portland division, with headquarters at Portland, Ore. In September, 1937, he was advanced to assistant to the general manager, with headquarters at San Francisco.

H. T. Livingston, whose promotion to superintendent of the Arkansas division of the Chicago, Rock Island & Pacific, with headquarters at Little Rock, Ark.,

H. T. Livingston

was announced in the June issue of *Railway Engineering and Maintenance,* was born at Golden City, Mo., on November 10, 1888, and graduated in civil engineering from the University of Missouri. Following his graduation he taught mathematics at the Santa Monica Military

Academy in California and served as an assistant in the engineering department of the Southern Pacific at Mojave, Cal. He entered the service of the Rock Island on May 15, 1909, as an instrumentman at Topeka, Kan., and in 1915, after occupying various minor positions, he was promoted to assistant engineer on the Iowa division at Cedar Rapids, Iowa. In 1916, he was promoted to master carpenter at Cedar Rapids, and in 1917 he enlisted in the United States Army. During the World War he served in France as captain of Company E, 313th Engineers, 88th division. Mr. Livingston returned to the Rock Island in 1919 as division engineer of the Minnesota division, with headquarters at Manly, Iowa, and was subsequently transferred to Des Moines, Iowa, and Little Rock, Ark. On January 16, 1930, he was promoted to engineer of construction, with headquarters at Chicago, and on May 16, 1936, he was appointed acting assistant superintendent at Little Rock, Ark. On July 1, 1936, he was advanced to district maintenance engineer at El Reno.

Walter O. Frame, whose promotion to superintendent of the Centerville division of the Chicago, Burlington & Quincy, with headquarters at Centerville, Iowa, was announced in the June issue, was born at Osceola, Iowa, on October 27, 1890, and entered railway service in 1905 in the track department of the Burlington at Osceola, serving successively as a section foreman, extra gang foreman and as a foreman in charge of construction until 1911, when he was made construction roadmaster on grade reduction work for the Kansas City Terminal. Two years later he went with the Chicago, Rock Island & Pacific as an extra gang foreman, later returning to the Burlington as an extra gang foreman on the St. Joseph division. In 1916, Mr. Frame was advanced to roadmaster on the Hannibal division, and from 1918 to 1921, he served as roadmaster and assistant trainmaster on the Aurora division. At the end of this period he was made inspector of maintenance of way on the staff of the general manager of the Lines East of the

Walter O. Frame

Missouri river, then being assigned to the Beardstown division, where he served as trainmaster and roadmaster until 1927. In March of that year he was appointed engineer maintenance of way of the Illinois district, being transferred to the Iowa district in August, 1927, and to the Central district in October, 1931. In July, 1936, Mr. Frame was advanced to assistant superintendent, with headquarters at Wymore, Neb., the position he held until his recent promotion. Mr. Frame has been active in the Roadmasters' and Maintenance of Way Association of America and was president of that organization in 1937-1938.

R. L. Sims, whose promotion to assistant superintendent of the Chicago, Burlington & Quincy, with headquarters at Wymore, Neb., was announced in the June issue of *Railway Engineering and Maintenance*, was born at Sturgeon, Mo., on December 12, 1891, and entered railway service with the Chicago, Burlington & Quincy on March 4, 1912. He was promoted to section foreman at Lowder, Ill., in April, 1916, and to extra gang foreman in April of the following year. He was advanced to assistant roadmaster on the Beardstown division on July 13, 1918, and in November of the same year he was promoted to roadmaster with headquarters at Herrin, Ill. He was transferred to Centralia, Ill., in August, 1919, and to the Chicago Terminal division the following February. On October 4, 1926, he was transferred to Chillicothe, Mo., and in May, 1927, he was advanced to district engineer of maintenance of way, with headquarters at Lincoln, Neb. A short time later, he was transferred to Alliance, Neb., and in April, 1928, he was transferred to Galesburg, Ill. Mr. Sims was transferred to Omaha, Neb., on May 15 of this year, and on June 1, he was promoted to assistant superintendent at Wymore, Neb.

R. L. Sims

Joseph F. Davis, superintendent of the Arkansas division of the Missouri Pacific, and an engineer by training and experience, has been promoted to general superintendent of the Western district, with headquarters at Kansas City, Mo. Mr. Davis was born at Brinkley, Ark., on April 25, 1878, and graduated from Ouachita College in Arkansas. He entered railway service in 1897 in the maintenance of way department of the St. Louis Southwestern, serving successively as a trackman, track foreman, extra gang foreman and brakeman until 1903. In that year Mr. Davis went with the Missouri Pacific as an extra gang foreman at Little Rock, Ark., and in 1906 he was promoted to roadmaster, with headquarters at Aurora, Mo. He was later transferred successively to Texarkana, Ark., and Gurdon, Ark. Following thirteen years' service as a roadmaster, Mr. Davis was promoted to general roadmaster, with headquarters at McGehee, Ark., and in 1920, was advanced to division engineer at Little Rock. On June 1, 1926, he was promoted to assistant superintendent and two years later he was advanced to superintendent of the Omaha division, with headquarters at Falls City, Neb. Mr. Davis was appointed district engineer at Little Rock in May, 1933, and the following year he was made acting superintendent of the Arkansas division, with the same headquarters, later being promoted to superintendent of that division.

Joseph F. Davis

Engineering

R. H. Smith, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has been transferred to Seattle, Wash., succeeding **Victor H. Garvey,** whose death on May 26 is announced elsewhere in these columns.

R. H. Meintel, supervisor of track on the Pennsylvania at Huntingdon, Pa., has been promoted to assistant division engineer of the Fort Wayne division, with headquarters at Fort Wayne, Ind., a newly created position.

W. D. Rhoads, supervisor of bridges and buildings of the Macon division of the Central of Georgia, with headquarters at Macon, Ga., has been promoted to division engineer of the same division and with the same headquarters, to replace **W. R. Golsan,** who retired on June 1, because of ill health.

L. T. Nuckols, division engineer of the Ashland division of the Chesapeake & Ohio, with headquarters at Ashland, Ky., has been advanced to engineer of track, with headquarters at Richmond, Va., succeeding **A. W. White,** whose appointment as general tie and timber agent at Cleveland, Ohio, is announced elsewhere in these columns, and **P. L. Koehler,** assistant division engineer at Russell, Ky., has been promoted to division engineer of the Ashland division relieving Mr. Nuckols.

H. S. Talman, assistant division engineer at Richmond, has been transferred to Russell, replacing Mr. Koehler.

F. T. Darrow, chief engineer of the Chicago, Burlington & Quincy, has been appointed also chief engineer of the Colorado & Southern, the Fort Worth & Denver City and the Wichita Valley, with headquarters as before at Chicago, succeeding **R. C. Gowdy,** whose death on June 10, is announced elsewhere in these columns, and **M. A. Stainer,** engineer of the Fort Worth & Denver City, with headquarters at Ft. Worth, Tex., has been promoted to assistant chief engineer of the Colorado & Southern, the Fort Worth & Denver City and the Wichita Valley, with headquarters at Denver, Colo., a newly-created position.

John W. Hopkins, designing engineer of the Bessemer & Lake Erie at Greenville, Pa., has been promoted to supervisor of track, with the same headquarters, relieving **John E. Yewell,** whose promotion to engineer of bridges and buildings is announced elsewhere in these columns. Mr. Hopkins was born in Philadelphia, Pa., on November 13, 1903, and attended Lehigh University and Pennsylvania State College, graduating in civil engineering from the latter institution in 1925. Immediately after graduation, he went with J. B. Long, consulting engineer, Norristown, Pa., and later became a bridge designer and division bridge engineer for the Pennsylvania Department of Highways. Mr. Hopkins entered the service of the Bessemer & Lake Erie on November 16, 1936, as designing engineer, the position he held until his recent promotion.

Ervin J. Bayer, assistant division engineer of the Ohio division of the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) at Springfield, Ohio, has been promoted to division engineer on the New York Central, with headquarters at Jersey Shore, Pa., succeeding **Frank G. Smith,** who has been transferred to the Illinois division of the Big Four, with headquarters at Mattoon, Ill., relieving **L. B. Elliott.** Mr. Elliott has been transferred to the Ohio division of the Big Four, with headquarters at Bellefontaine, Ohio, replacing **John E. Kissell,** whose death on May 8, was announced in the June issue. **Edgar A. Humphreys,** office engineer in the office of the chief engineer of the Big Four at Cincinnati, Ohio, has been appointed assistant division engineer at Springfield, succeeding Mr. Bayer, and **Walter S. Chanckle,** assistant engineer of the Peoria & Eastern at Indianapolis, Ind., has been promoted to office engineer at Cincinnati, replacing Mr. Humphreys.

T. M. Pajari, whose promotion to division engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Terre Haute, Ind., was announced in the June issue of *Railway Engineering and Maintenance,* was born at Butte, Mont., on January 18, 1905, and graduated from the University of Minnesota in 1927. He entered the service of the Milwaukee in 1928 as a rodman in the engineering department at Minneapolis, Minn. He later served as instrumentman at Chamberlin, S.D., instrumentman at Minneapolis, assigned to work in the Twin City Terminals, and assistant engineer in charge of maintenance of way at Mason City, Iowa. In 1935, he was transferred to the Coast division at Seattle, Wash., as office engineer, and a year later he was promoted to office engineer at Chicago. During the summer of 1938, he was appointed acting chief carpenter of the Coast division, later returning to the position of office engineer at Seattle, the position he held at the time of his recent promotion.

Elzear J. Brown, whose promotion to district engineer of maintenance of way on the Chicago, Burlington & Quincy, with headquarters at Galesburg, Ill., was announced in the June issue of *Railway Engineering and Maintenance,* was born at St. Joseph, Mo., on December 1, 1900, and attended the St. Joseph Commercial College and St. Patrick Commercial Academy. He entered railway service on May 26, 1919, as a clerk in the general yardmaster's office on the Burlington at Chicago, and was later transferred to the superintendent's office. On June 1, 1920, he was appointed an assistant roadmaster, later returning to a clerical position at

Elzear J. Brown

Chicago. The following year he was appointed an assistant extra gang foreman and in November, 1921, he was promoted to section foreman. During the next four years Mr. Brown served at various points in Illinois and Wisconsin as section foreman and extra gang foreman. In January, 1925, he was advanced to assistant roadmaster on the Chicago-Aurora division and in September, 1926, he was transferred to Beardstown, Ill. One month later he was promoted to roadmaster, with headquarters at Chicago, the position he held until his recent promotion.

J. C. Aker, whose promotion to assistant chief engineer of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., was announced in the June issue of *Railway Engineering and Maintenance,* was born at Delaware City, Del., on March 9, 1889, and graduated from the University of Delaware in 1908. He entered railway service in the engineering corps of the Louisville & Nashville on March 10, 1910, and served in various capacities on construction work in Kentucky, Tennessee and Alabama. On October 1, 1915, he went with the N. C. & St. L. as a resident engineer on the construction of various grade revision projects. During the war he joined the U. S. Army as a private in the engineering corps, serving with the 211th regiment of engineers, and was later commissioned a second lieutenant. He returned to the N. C. & St. L. in February, 1919, as assistant engineer in the valuation and real estate department. Mr. Aker was transferred to the maintenance of way department and assigned to the bridge department in 1923. In 1927, he was assigned to the chief engineer's office as assistant engineer in connection with tie and timber treatment, maintenance expenditures and various other duties.

A. J. Gayfer, whose promotion to division engineer on the Canadian National, with headquarters at Calgary, Alta., was announced in the June issue of *Railway Engineering and Maintenance,* was born at Uxbridge, England, on January 26, 1877, and entered railway service on April 10, 1898, on location and construction work in Ontario and Minnesota on the Manitoba & Southeastern (now part of the Canadian National) and later on the Ontario & Rainy River, (now Canadian Northern part of the C.N.R. system). He subsequently served as resident engineer on construction and later as division engineer on construction at various points in Manitoba, Prince Albert and Saskatchewan. On January 1, 1912, he was appointed locating engineer on the main line east of Port Arthur, Ont., and from 1913 to 1915, he served as division engineer on construction on the Port Arthur district. During the war he served overseas in France and Belgium as a major and chief engineer, Canadian Railways Troops, 12th Battalion. In April, 1919, he returned to the C.N.R. as division engineer on construction, and locating engineer in Saskatchewan and Alberta; and on August 5, 1926, he was appointed division engineer with headquarters at Melville, Sask. In February, 1927, he was transferred to Dunblane, Sask., as division engineer of construction at that point and the following year he was appointed supervising engineer of construction at Winnipeg, Man. Mr. Gayfer was appointed division engineer with headquarters at Edson, Alta., on March 1, 1932, and on June 16, 1933, he was appointed assistant division engineer at Edmonton, Alta.

Wendale Arthur Gunderson, whose promotion to district maintenance engineer on the Chiacgo, Rock Island & Pacific, with headquarters at Kansas City, Mo., was announced in the June issue of *Railway Engineering and Maintenance,* was born at Nordness, Iowa, on October 18, 1902, and attended the State University of Iowa for three years. He entered railway service on June 7, 1917, between terms at school as a station helper at Montezuma, Iowa, serving in this capacity and as relief clerk during vacations from school until 1922. He returned to the Rock Island in November, 1925, as a chainman at Cedar Rapids, Iowa, and on April 22, 1926, was promoted to instrumentman and later to levelman on location and construction work at Amarillo, Tex. In 1928 he was transferred to Jamesport,

Mo., as instrumentman on location work on the Rock Island's Coburn-Birmingham line and on October 26, 1929, he was promoted to resident engineer at Jamesport, later being transferred to Trenton, Mo. On September 30, 1931, Mr. Gunderson was appointed track inspector, with headquarters at Fairbury, Neb., and on July 1, 1936, he was promoted to acting roadmaster at Fairbury, later returning to his position as track inspector. On August 1, 1937, he was promoted to roadmaster on the Oklahoma division, with headquarters at El Reno, Okla., and two months later he was transferred to Little Rock, Ark. Mr. Gunderson was transferred to Pratt, Kan., on October 7, 1938, where he was located at the time of his recent promotion.

John E. Yewell, supervisor of track on the Bessemer & Lake Erie, with headquarters at Greenville, Pa., has been promoted to engineer of bridges and buildings, with the same headquarters, succeeding **John S. Ekey,** whose death on June 3 is announced elsewhere in these columns. Mr. Yewell was born in Baltimore, Md., on June 23, 1892, and graduated in civil engineering from Cornell University in 1912. He entered railway service in August of that year as a rodman in the engineering department of the Baltimore & Ohio, and in January, 1913, he went with the Bessemer & Lake

John E. Yewell

Erie as a draftsman. In 1917, Mr. Yewell was promoted to chief draftsman and on December 1, 1936, he was advanced to supervisor of track.

Forrest H. McKenney, whose promotion to district engineer of maintenance of way on the Chicago, Burlington & Quincy, with headquarters at Omaha, Neb., was announced in the June issue, of *Railway Engineering and Maintenance* was born at Malcolm, Neb., on August 10, 1896, and graduated in civil engineering from the University of Nebraska in 1920. He entered railway service on August 23, 1919, as a draftsman on the Burlington, later serving as an instrumentman on location surveys. On September 1, 1922, he was promoted to resident engineer on construction work on the Beardstown division and on June 1, 1925, he was appointed instrumentman in the engineering department of the general office at Chicago. Mr. McKenney was promoted to division engineer, with headquarters at Beardstown, Ill., on October 1, 1929, and on March 16, 1933, he was appointed division engineer and assistant master carpenter at Beardstown. He was appointed assistant engineer in charge of the rail detector car on August 16, 1934, the position he held until his recent promotion.

Marcus L. Johnson, whose promotion to assistant bridge engineer of the Chicago, Burlington & Quincy, with head-

Marcus L. Johnson

quarters at Chicago, was announced in the June issue of *Railway Engineering and Maintenance,* was born at Chicago on March 18, 1893, and graduated in civil engineering from the University of Illinois in 1916. Immediately after graduation he entered the service of the Burlington as a draftsman in the bridge engineering department at Chicago and from 1916 to 1929 served successively as draftsman, estimator and engineering accountant. In the latter year, he was appointed acting office engineer and in 1931, he was made chief designer. Mr. Johnson was promoted to office engineer in the bridge engineering department at Chicago in 1936, and held that position until his recent promotion which was effective May 16.

W. H. Barnard, assistant bridge engineer of the Southern, with headquarters at Washington, D.C., has been appointed

W. H. Barnard

bridge engineer, succeeding **M. R. Strong,** deceased. **O. B. Robbins,** assistant engineer at Washintgon, has been appointed assistant bridge engineer, succeeding Mr. Barnard.

Mr. Barnard was born at Poughkeepsie, N.Y., on December 24, 1890, and graduated in civil engineering from the Baltimore Polytechnic Institute in 1913. Shortly after graduation he entered the service of the American Bridge Company as a draftsman at its plant at Edge Moor, Del., remaining with this company until December, 1916, when he entered the service of the Southern as an assistant engineer in the bridge department at Washington. In May, 1917, Mr. Barnard was transferred to Charlotte, N.C., where he was advanced to assistant engineer of bridges for the Lines East in 1922. In 1925, he returned to Washington as structural engineer in the office of the assistant to the vice-president in charge of maintenance. Six years later Mr. Barnard was appointed assistant bridge engineer of the system.

Track

Carl E. Miller has been promoted to assistant roadmaster on the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at Altoona, Wis., a newly created position.

Ora Clark has been appointed acting supervisor of track on the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) at Greensburg, Ind., relieving **William Shallenberg,** who is off duty on account of illness.

Steve Robertson, track supervisor on the Chicago, Rock Island & Pacific at Enid, Okla., has been promoted to roadmaster, with headquarters at Chickasha, Okla., relieving **John H. Lynch,** who has retired.

Vern W. Reed, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Atlantic, Iowa, has been transferred to Iowa Falls, Iowa, succeeding **J. H. Logan,** who in turn has been transferred to Atlantic replacing Mr. Reed.

George Green, track supervisor on the Chicago, Burlington & Quincy, has been promoted to roadmaster at Orleans, Neb., succeeding **K. W. Eustace,** who has been transferred to South Sioux City, Neb., replacing **S. J. Owens, Jr.,** who has been assigned to special work.

Ray M. Bristow, track supervisor on the Chicago, Rock Island & Pacific at St. Louis, Mo., has been promoted to roadmaster, with headquarters at St. Joseph, Mo., replacing **C. M. Webb,** who has been transferred to Enid, Okla. Mr. Webb replaces **John A. Trainor,** who has retired.

H. Fraser, section foreman on the Canadian National at Biggar, Sask., has been appointed acting roadmaster on the Saskatoon division, with headquarters at Kindersley, Sask., succeeding **J. P. Owen,** who has been transferred to Melville, Sask., replacing **A. G. Ayers,** who has retired.

W. A. Gossett, transitman on the Illinois-Missouri division of the Atchison, Topeka & Santa Fe, has been promoted to roadmaster, with headquarters at Ottawa, Kan., succeeding **A. F. Ewart,** who has been transferred to Chillicothe, Ill.

Mr. Ewart replaces **H. G. Wood,** whose promotion to transportation inspector is announced elsewhere in these columns.

Due to changes in assigned roadmaster's territories on the Missouri-Kansas-Texas, the position of roadmaster held by **J. W. Launberg,** has been abolished and Mr. Launberg has returned to his former position as section foreman. Headquarters of other roadmasters have been changed as follows: **J. L. Brant,** from Muskogee, Okla., to Franklin, Mo.; **R. Sherman** from McAlester, Okla., to Muskogee; and **Fred Hunter** from Houston, Tex., to Parsons, Kan.

David M. Engler, a section foreman on the Electric division of the New York Central, has been appointed assistant supervisor of track of Subdivision No. 1 of the same division, with headquarters at New York, to succeed **J. J. McCarthy,** who has retired. **Michael Moryks,** an assistant section foreman, has been promoted to assistant supervisor of track of Sub-division No. 22 of the Mohawk division, with headquarters at Selkirk, N.Y., succeeding **J. A. Van Alstyne,** who has also retired.

A. R. Matteson, assistant supervisor of track on the Philadelphia division of the Pennsylvania, has been promoted to supervisor of track on the Cleveland division, with headquarters at Orrville, Ohio, to succeed **W. T. Hammond,** who has been transferred to the Middle division, with headquarters at Huntingdon, Pa., where he replaces **R. H. Meintel,** whose appointment as assistant to the division engineer of the Fort Wayne division is noted elsewhere in these columns. **A. K. Howe,** assistant on the engineering corps, has been promoted to assistant supervisor of track on the Philadelphia division at Harrisburg, Pa., succeeding Mr. Matteson.

Walter Burke has been promoted to supervisor of track of the Andalusia district of the Columbus division of the Central of Georgia, with headquarters at Union Springs, Ala., succeeding **W. E. Chapman,** who has been transferred to the Columbus division, with jurisdiction over the Americus and Greenville districts and the Columbus (Ga.) yard, with headquarters at Columbus. Mr. Chapman replaces **J. W. Hightower,** who has been transferred to the Atlanta and Thomaston districts of the same division, with headquarters at Griffin, Ga., where he succeeds **G. W. Benson,** whose appointment as supervisor of bridges and buildings is noted elsewhere in these columns.

L. H. Miller, assistant supervisor of track on the New York division of the Pennsylvania, has been promoted to supervisor of track on the Delmarva division, with headquarters at Harrington, Del., succeeding **K. J. Silvey,** who has been transferred to the office of supervisor of operating expenditures. **M. B. Jamin,** assistant on the engineering corps, has been promoted to assistant supervisor of track on the Williamsport division at Lock Haven, Pa., to replace **J. L. Tedesco,** who has been transferred to the Philadelphia division, with headquarters at Downingtown, Pa., where he succeeds **S. M. Rodgers,** who has been transferred to the New York division, with headquarters at New Brunswick, N.J., to replace Mr. Miller.

James Kiloran, whose promotion to district roadmaster on the Great Northern, with headquarters at Breckenridge, Minn., was announced in the June issue of *Railway Engineering and Maintenance,* was born at St. Cloud, Minn., on March 3, 1903, and entered railway service on June 16, 1920, as a section laborer on the Great Northern. He later served as a welder helper on the Fergus Falls and St. Cloud divisions and on January 20, 1927, he was promoted to assistant section foreman of the St. Cloud yard. In September, 1929, he was advanced to extra gang foreman and served as extra gang foreman and section foreman on the St. Cloud and Willmar divisions until July 5, 1936, when he was promoted to track inspector on the Willmar division. On June 1, 1937, he was advanced to district welding foreman of the Eastern district and on October 16, 1938, he was appointed track inspector on the Willmar division, the position he held at the time of his recent promotion.

George W. Williams, whose promotion to roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Pratt, Kan., was announced in the June issue of *Railway Engineering and Maintenance,* was born at Tebbets, Mo., on October 17, 1890, and entered railway service on September 12, 1908, as a section laborer on the Rock Island. In June, 1917, he was promoted to apprentice foreman and one month later he was advanced to section foreman. In April, 1919, he was appointed extra gang foreman and gravel inspector at Meta, Mo., and the following June he returned to his position as section foreman. In February, 1930, he was appointed yard foreman at Armourdale, Kan., and on July 9, 1936, he was promoted to track supervisor of the Armourdale terminal. Mr. Williams was promoted to assistant roadmaster in charge of one of the system rail laying gangs on April 7, 1939, the position he held at the time of his promotion to roadmaster, which was effective May 1.

Bridge and Building

G. W. Benson, supervisor of track on the Central of Georgia, with headquarters at Griffin, Ga., has been appointed supervisor of bridges and buildings of the Macon division, with headquarters at Macon, Ga., succeeding W. D. Rhoads, whose appointment as division engineer is announced elsewhere in these columns.

F. B. Robins, assistant engineer in the office of the engineer maintenance of way of the Chesapeake & Ohio, whose promotion to assistant general supervisor of bridges and buildings, with headquarters as before at Richmond, Va., was reported in the June issue of *Railway Engineering and Maintenance* was born on September 17, 1900, at Richmond. Mr. Robins obtained his higher education at the Massachusetts Institute of Technology, graduating in 1923. He entered railway service with the C. & O. on January 16, 1924, as a draftsman in the chief engineer's office at Richmond. Three years later Mr. Robins left this company to go with the New York Central as a draftsman in the office of the principal assistant engineer at Cleveland. In September, 1928, he returned to the C. & O. as an assistant engineer in the office of the chief engineer at Richmond. In October, 1932, he was transferred to the office of the engineer maintenance of way, where he remained until his recent promotion to assistant general supervisor of bridges and buildings of the Chesapeake & Ohio.

Special

A. W. White, engineer of track of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been promoted to general tie and timber agent of the C. & O., the New York, Chicago & St. Louis (Nickel Plate) and the Pere Marquette, with headquarters at Cleveland, Ohio, succeeding **Wallace S. King,** whose death on April 14 was announced in the May issue.

Mr. White was born at Louisville, Ky., on January 18, 1884, and graduated from Valparaiso University in 1910. On September 15, 1910, he entered railway service on the Sandy Valley & Elkhorn (a subsidiary of the B. & O.) as a rodman in the engineering department, later serving as a draftsman. In 1913, he was promoted to supervisor of track and between 1920 and 1925, he continued as supervisor, but with certain engineering responsibilities. On July 1, 1925, when the C. & O. took over the Sandy Valley & Elkhorn (a subsidiary of the C. & O.), he went with the C. & O. as an assistant division engineer and on September 8, 1930, he was advanced to division engineer. Mr. White was promoted to engineer of track, with jurisdiction over the entire system on June 1, 1936, and held that position until his recent promotion to general tie and timber agent.

Obituary

John R. Cralle, who retired in 1933 as a roadmaster on the Norfolk division of the Norfolk & Western, with headquarters at Lynchburg, Va., died on May 22.

D. B. Taylor, who retired in the spring of 1925 as master carpenter on the Baltimore & Ohio, with headquarters at Grafton, W. Va., died in the Henrotin hospital in Chicago on June 13.

P. N. Nelson, who retired in 1934 as supervisor of bridges and buildings on the Southern Pacific, with headquarters at San Francisco, Cal., died at his home in San Jose, Cal., on April 22. Mr. Nelson was active for many years in the American Railway Bridge and Building Association and served as one of the directors.

K. G. Nilsson, bridge and building foreman on the Canadian National, has been promoted to roadmaster on the Calgary division, with headquarters at Mirror, Alta., relieving **W. White,** who has been transferred to Edmonton, Alta., replacing **W. J. Walker,** deceased.

Ben B. Shaw, who resigned as division engineer on the Chicago, Rock Island & Pacific, with headquarters at Little Rock,

Ark., in November, 1922, to become chief engineer of the Cuba railway, died of a heart ailment at Macon, Ga., on June 3, at the age of 53. Mr. Shaw, at the time of his death, was manager of the Georgia Kaolin Company's plant at Dry Branch, Ga.

John Stevens Ekey, engineer of bridges and buildings of the Bessemer & Lake Erie, with headquarters at Greenville, Pa., died at his home in Greenville on June 3. Mr. Ekey was born at Parker, Pa., on March 8, 1879, and attended Allegheny College, Meadville, Pa. He entered railway service on the Pittsburgh & Lake Erie in 1902, and later was employed by the City of Pittsburgh and the Borough of Grove City, Pa. He entered the service of the Bessemer and Lake Erie on June 1, 1916, in the engineering department, and served in various capacities until November 1, 1919, when he was appointed supervisor of structures. On May 1, 1931, he was advanced to engineer of bridges and buildings, the position he held until his death.

Victor H. Garvey, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Seattle, Wash., died on May 26 at the Providence hospital in that city after an operation which followed a very brief illness. Mr. Garvey was born in Hiawatha, Kan., on May 13, 1886, and graduated in civil engineering from the University of Washington in 1909. After leaving school he served in various engineering capacities from rodman to assistant engineer, with the Alaska Central, the Oregon-Washington Railroad & Navigation Company (now part of the Union Pacific system), Stone and Webster and the Canadian Pacific. From 1913 to 1917 he engaged in general contracting as a member of the firm of Jarvis and Garvey and from December, 1917, to August, 1919, he was in overseas service as captain of the 23rd Engineers, U. S. Army. On his return he entered the service of the Milwaukee, and except for a short period at Miles City, Mont., has been located in Seattle as assistant engineer.

Roy Cotsworth Gowdy, chief engineer of the Colorado & Southern, the Fort Worth & Denver City and the Wichita Valley, with headquarters at Denver, Colo., died suddenly at his cabin in the mountains near that city on June 10. Mr. Gowdy was born at Washington, Iowa, on September 3, 1878, and attended Colorado College for one year. He entered railway service in 1899 as a rodman and assistant engineer on the Colorado Springs & Cripple Creek (now part of the Colorado & Southern), serving in this capacity until 1900, when he resigned to enter college. In September, 1901, he returned to the Colorado Springs & Cripple Creek as a rodman and draftsman and a year later he went with the Denver, Northwestern & Pacific (now part of the Denver & Salt Lake) as a draftsman and levelman on location and construction work. In 1905, he returned again to the Colorado Springs & Cripple Creek as assistant engineer and chief draftsman and in 1906, he became a draftsman and clerk in a consulting engineer's office at Colorado Springs, Colo. In 1907 he was appointed resident engineer on the Fort Worth & Denver City, with headquarters at Fort Worth, Tex. Mr. Gowdy was advanced to chief engineer of the F. W. & D. C. and of the Wichita Valley in 1910, and in 1918, he was appointed corporate chief engineer of those lines, and also of

Roy Cotsworth Gowdy

the Colorado & Southern, with headquarters at Denver. In 1920, after the period of government control, Mr. Gowdy became chief engineer of those lines.

Arthur H. Peterson Dies

Arthur H. Peterson, formerly roadmaster on the Chicago Terminal division of the Chicago, Milwaukee, St. Paul & Pacific, and from July 1 to October 1, 1938, managing editor of the Railway Engineering and Maintenance Cyclopedia, died at his home in Spencer, Ia., on June 26 after a lingering illness. A sketch of his railway career was published in *Railway Engineering and Maintenance* for August, 1938, page 498.

Mr. Peterson was a man of unusual ability. Early acquainted with track work as a son of a section foreman and having himself worked as a section laborer and having studied law for four years at the University of Chicago, during which time he made the university's debating team, he early won recognition for himself in railway service as a student of track matters and as a speaker at safety rallies, with the result that in 1931 he was promoted to roadmaster in charge of the Chicago terminals of the Milwaukee, a most difficult assignment. Becoming interested in the work of the Roadmasters Association, he quickly won recognition as a committee chairman; he was elected a member of the Executive Committee, later a vice-president and at the last convention he was made president of the association, only to be forced to relinquish this responsibility, by ill health a month later.

In the short time that he was engaged in the work on the Railway Engineering and Maintenance Cyclopedia he demonstrated a grasp of maintenance matters, an adaptability to new environment, an energy and a loyalty that were most outstanding. Even after he was forced to recognize the futility of his struggle, he continued at his desk until pain laid him low. In his passing, maintenance of way service loses a man with a most promising future.—Elmer T. Howson.

Association News

Bridge and Building Association Activities

President Armstrong Chinn has called a meeting of the Executive Committee in Chicago on August 7, at which time, in addition to other business preparatory to the convention, the chairmen of technical committees will present reports for review prior to their completion for presentation before the convention.

The Wood Preservers Association

The Executive committee of the American Wood Preservers Association met at Chicago on June 14 to further organize the work of the Association for the year. Secretary H. L. Dawson reported that the reprinting of the book, "Decay of Ties," including the inclusion of an additional paper therein, was approaching completion and that the books would soon be available for distribution.

The Proceedings of the 1939 convention held in Washington, D. C., last January are now in the hands of the printer, and it is expected that they will be distributed to members during July.

Bridge and Building Supply Men's Association

At a meeting of the officers on June 16, a decision was reached to exhibit in connection with the convention of the American Railway Bridge and Building Association at the Hotel Stevens on October 17-19, and reservation blanks have been sent to interested companies.

With the same adequate space available for this exhibit that is used by the Track Supply Association concurrently with the Roadmasters Convention, it is anticipated that the bridge and building exhibit this year will be one of the most extensive ever presented by this association.

Track Supply Association

The Track Supply Association has received 53 applications for membership to date, 29 of which memberships have been accompanied by reservations for exhibit space. The number of spaces reserved to date is almost twice the number reserved as of this date a year ago. Applications should be addressed to Lewis Thomas, secretary-treasurer, Track Supply Association, 59 East Van Buren street, Chicago.

The companies that have made application for space to date include:

American Fork & Hoe Co., Cleveland, Ohio.

Barco Manufacturing Co., Chicago.

Buda Co., Harvey, Ill.

Creepcheck Co., Inc., New York.

Crerar, Adams & Co., Chicago.

Cullen-Friestedt Co., Chicago.

DeSanno & Son, Inc., A. P., Philadelphia, Pa.

Duff-Norton Manufacturing Co., Pittsburgh, Pa.

Electric Tamper & Equipment Co., Ludington, Michigan.

Continued on page 438

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Oxweld Railroad Service Co., Chicago.
Pocket List of Railroad Officials, New York.
Positive Rail Anchor Co., Chicago.
Q & C Co., New York.
Rail Joint Co., New York.
Rails Co., New Haven, Conn.
Railway Engineering and Maintenance, Chicago.
Railway Track Work Co., Philadelphia, Pa.
Standard Equipment Co., Chicago.
Templeton, Kenly & Co., Chicago.
Warren Tool Corp., Warren, Ohio.
Woodings-Verona Tool Works, Verona, Pennsylvania.

Roadmasters Association

A meeting of the Executive committee and chairmen of committees was held in Chicago on June 17, with President F. B. Lafleur, Vice-President G. L. Sitton, Secretary C. A. Lichty, Treasurer E. E. Crowley, Directors A. B. Hillman, E. L. Banion and R. L. Sims, Past-President Elmer T. Howson and Committee Chairmen C. W. Baldridge, J. M. Murphy, L. J. Gilmore and H. E. Kirby present. Secretary Lichty presented 51 applications for membership, which were approved, bringing the number of members elected since the last convention to 76.

After approving arrangements made with the Hotel Stevens for the holding of the convention and developing a tentative program for the meeting, the Executive committee discussed the reports of the various subject committees in detail and returned the reports to the committees with suggestions for their completion and presentation at the convention.

American Railway Engineering Association

Eleven committees of the association held meetings during June, including those on Rules and Organization, at New York, on June 2; Water Service, Fire Protection and Sanitation, at Atlantic City, N. J., on June 13; Roadway and Ballast, at New York, on June 15 and 16; Economics of Railway Location and Operation, at Richmond, Va., on June 15 and 16; Records and Accounts, at Baltimore, Md., on June 20; Ties, at Patterson, N. J., and Port Reading, on June 22 and 23; Masonry, at New York, on June 22 and 23; Highways, at Chicago, on June 27; Yards and Terminals, at Rochester, N. Y., on June 27; and Buildings, at New York, on June 27 and 28. As a part of its work during the year, the Committee on Economics of Railway Location and Operation is conducting dynamometer tests on the Denver & Salt Lake to determine the difference in train resistance on curves, resulting from the installation of rail and flange lubricators.

Only three committees have as yet scheduled meetings for July, these being the Committee on Iron and Steel Structures, which will meet at Detroit, Mich., on July 6 and 7, and the Committee on Maintenance of Way Work Equipment, which will meet at New York on July 20 and 21.

It has been announced that, on the request of Dr. A. N. Talbot, chairman of the Committee on Stresses in Track, the Association of American Railroads has authorized a supplemental appropriation of $3,000 for the use of the committee in order that it might participate in driver slip tests conducted on the Pennsylvania. It is expected that this additional appropriation, which brings the total appropriation made to the committee for the calendar year 1939 to $23,000, will enable Dr. Talbot's staff to develop information of value to the Joint Committee on Relation Between Track and Rolling Stock, of which Dr. Talbot is also chairman.

Work on the 1939 Proceedings is completed and this volume is now being mailed to members.

Supply Trade News

Personal

Gordon F. Hess, assistant manager of sales of the Alloy Steel division of the **Republic Steel Corporation,** Massillon, Ohio, has been appointed sales manager of the Houston, Tex., district.

J. J. Alves, Jr., northeastern regional representative of the Railroad division of the **Worthington Pump & Machinery Corp.,** Harrison, N.J., has taken over also the southeastern region, **W. M. Vinnedge,** formerly southeastern regional representative having resigned.

H. R. Condon, vice-president in charge of the Eastern division of The Wood Preserving Corporation, with headquarters at Philadelphia, Pa., has been transferred to the general office at Pittsburgh, Pa., where he will be concerned with the company's activities throughout the United States.

Edwin J. Schwanhausser, works manager at the Buffalo, N.Y., plant of the **Worthington Pump & Machinery Corporation,** Harrison, N.J., has been elected a vice-president. Mr. Schwanhausser as vice-president and works manager will continue in his present responsibilities.

W. Robert Timken has been appointed assistant to the president of **The Timken Roller Bearing Company,** Canton, Ohio. Since graduating from Harvard University in 1933, he has been active in the office and factory, serving in various capacities throughout the plant. He will continue his headquarters in the general office at Canton.

The American Rolling Mill Company, Middletown, Ohio, has promoted a number of the men on its staff as follows: **F. E. Vigor,** manager of the Ashland, Ky., division since 1929, has been appointed general transportation manager, with headquarters in the general office at Middletown, and **R. R. Smith,** general superintendent of the Ashland division, succeeds him as manager; **R. G. Adair,** assistant director of personnel and public relations, has been appointed assistant manager of Armco operations in Ashland; **K. C. McCutcheon,** has been appointed general superintendent of the Ashland plant; **W. Fred Songer,** has been appointed assistant to the manager at Ashland; **W. F. Johnston,** has been appointed assistant to the general superintendent at the Middletown plant and **J. W. Paton,** has been appointed special representative in charge of Armco's properties at Ashland.

H. M. Starrett, treasurer of **Fairmont Railway Motors, Inc.,** has been elected chairman of the board and president, and **W. F. Kasper,** vice-president, has been elected also vice-chairman of the board. **John P. Dunning,** vice-chairman of the board has resigned from that position to become treasurer. These elections took place at a meeting of the board of directors on May 23, following the death of **Harold E. Wade,** chairman of the board and president, which was announced in the June issue. Mr. Starrett will continue in active charge of factory operations, and Mr. Kasper in active charge of the sales and engineering departments, while the duties which were performed by Mr. Wade will be divided between these two officers.

Mr. Starrett entered the employ of the Fairmont Company in 1909, after graduating from the mechanical engineering department of the University of Minnesota. In 1913, he resigned to enter the employ of the Packard Motor Car Company, and during the war served with the Bureau of Aircraft Production. In 1919, he again entered the employ of Fairmont, and since has had charge of manufacturing.

Mr. Kasper entered the employ of Fairmont in 1913 after graduating from the mechanical engineering department of the University of Minnesota, and has been with the company continuously since that time, as head of the engineering department. Upon the death of Frank Wade in 1919, Mr. Kasper was also placed in charge of the sales department as chief engineer and sales manager. He held this position until 1929 when he was elected vice-president.

Obituary

E. H. Bell, president of the **Track Supply Company,** Chicago, and formerly president of the Railroad Supply Company, died at Sheridan, Ill., on May 19 of a complication of ailments.

Earl L. Colopy, sales representative in the eastern region of the Transportation Department of **Johns-Manville Sales Corporation,** New York, died at Jersey City Medical Center, Jersey City, N.J., on May 17, after a brief illness. Mr. Colopy was born at Lockport, N.Y., November 22, 1887, and entered the service of Johns-Manville in 1908 as a stenographer and since 1918, had served as a sales representative until his death.

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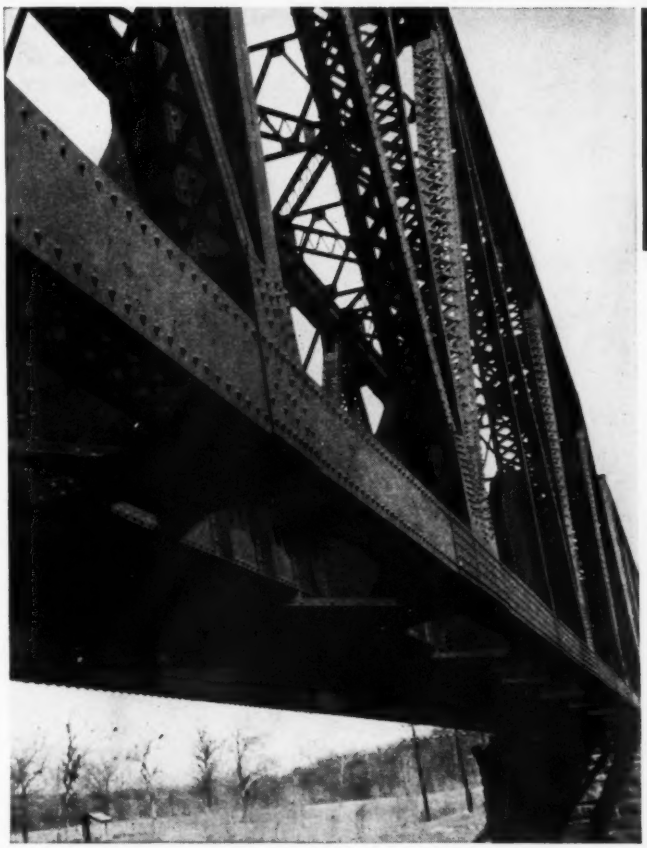

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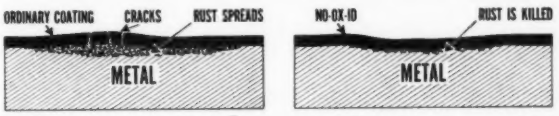

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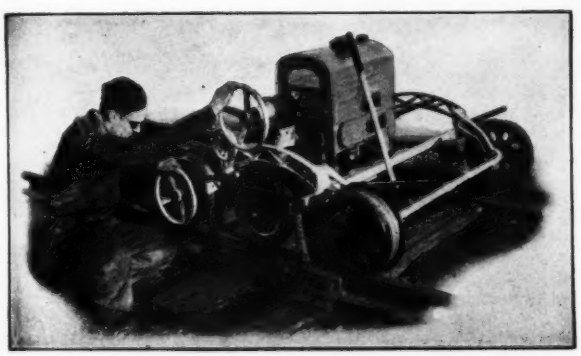

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Economically and efficiently removes surplus metal deposited in building up cupped joints, frogs and crossings by welding. Gasoline engine driven. Lateral movement, vertical adjustment and speed of grinding wheel all under easy control. One-man derailing device. Flexible shaft extension operates auxiliary attachments—straight wheel hand piece, cup wheel hand piece, cross cut machine, drill, etc. One of many models.

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"How did that happen? We ship a *lot more* freight than they do. Didn't you call that to their attention?"

"I certainly did—and that's the trouble. They didn't like it a bit."

"What do you mean?"

"Just this. They told me in no uncertain terms that they bought what they needed on merit—just as they said our traffic manager does. They said that our traffic had been "sold" to their company a half dozen times already—and that this argument never created an additional pound of traffic for the railways as a whole. And then they pointed out to me the amount of freight that we are giving the trucks and the waterways. Boss, that reciprocity argument may go over in some places but it's 'dynamite' among these railway engineers. They *know* what they want and *they get it.*"

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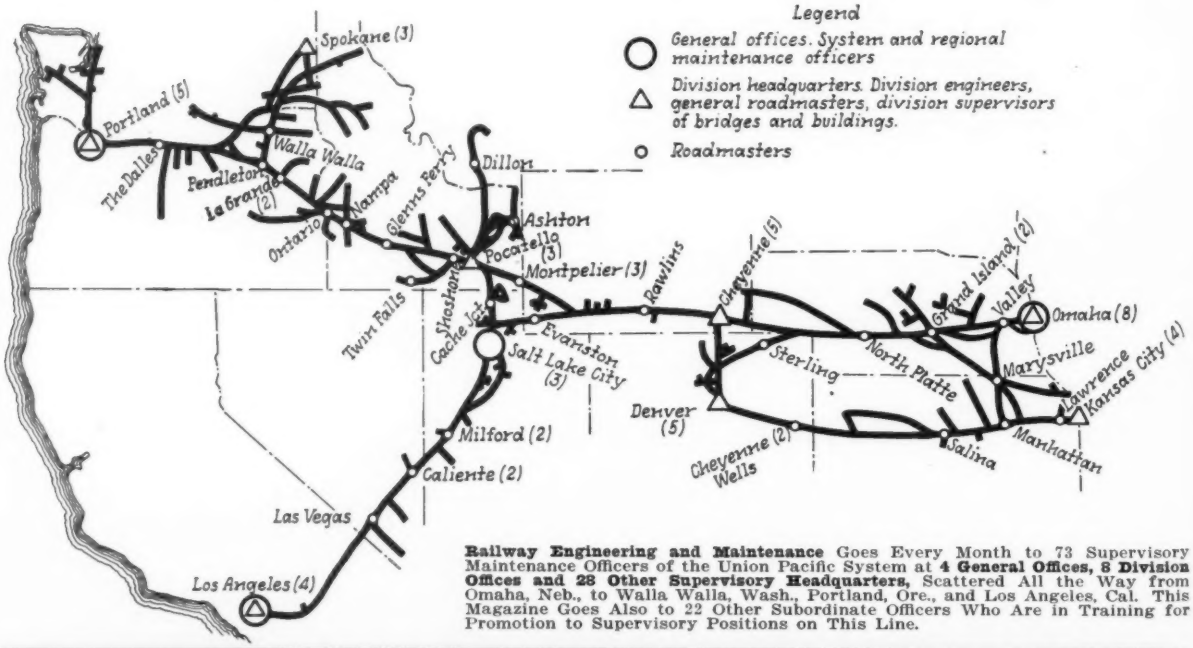
"Perhaps we'd better follow the same plan."

"I wish we could, Boss. It'd help me a lot with the railway engineers that I call on—and it'd also keep our story before a lot of other men that I'm never able to see. It's the modern way of selling."



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TAPES — RULES — PRECISION TOOLS

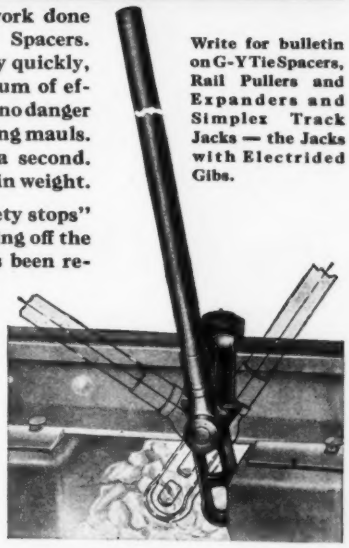
Simplex Tie Spacers Save Time, Cut Costs!

Track crews get more work done with Simplex G-Y Tie Spacers. They move ties either way quickly, safely and with a minimum of effort—no sledging of ties—no danger to track men from swinging mauls. On and off the rail in a second. Strong, easy to use; light in weight.

New model features "safety stops" to eliminate the unit falling off the rail. Upright bracket has been removed, saving 5 pounds in weight, and providing for operator using both hands on the tie lever.

G-Y Tie Spacers were designed by one of the largest Class "A" railroads — now used by many railroads to save time and cut costs.

Write for bulletin on G-Y Tie Spacers, Rail Pullers and Expanders and Simplex Track Jacks — the Jacks with Electrided Gibs.



TEMPLETON, KENLY & CO., Chicago

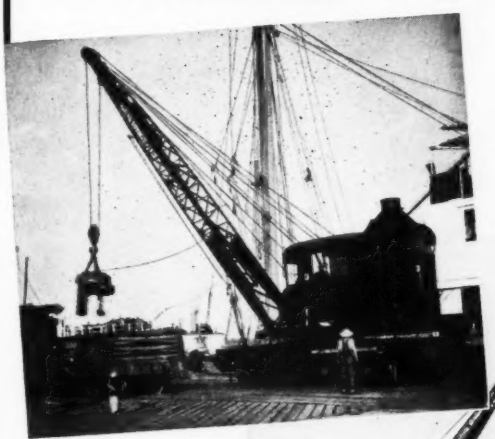
Cutting Maintenance of Way Costs Since 1899

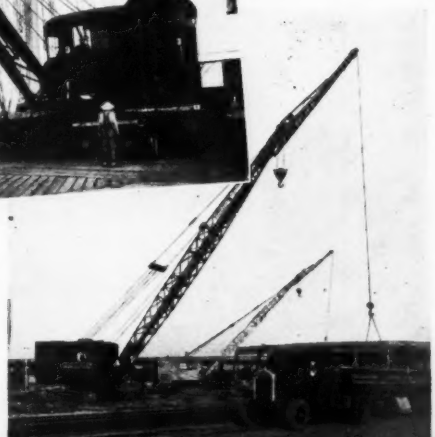
Representatives in Principal Cities

SIMPLEX

GOLD MEDAL AWARD SAFETY JACKS

ENGINEERED IN TUNE WITH *Today...*





Above: Modern Industrial Brownhoist 25-ton steam crane handling scrap. Right: Two 15-ton gasoline powered crawler cranes on steel erection work.

The work which a new Industrial Brownhoist locomotive or crawler crane will do on your job—the money it will save—cannot be accurately estimated from the quality of materials used in its construction or the size of its engine. Call it modern engineering or what you will, the skillful co-ordination of details is what really makes an Industrial Brownhoist — makes it last longer, perform better and do more work.

In the past few years many new Industrial Brownhoists have replaced old cranes which still had years of good service left in them. In practically every instance they were purchased because we proved that an Industrial Brownhoist could save 25% to 50% over existing handling costs.

Would you like to know if such savings are possible in your plant? Our near-by sales engineer will gladly help you compile the data.

INDUSTRIAL BROWNHOIST

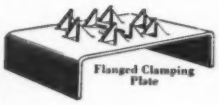
GENERAL OFFICES: BAY CITY, MICHIGAN

DISTRICT OFFICES

New York, Philadelphia, Pittsburgh, Cleveland, Chicago.

TECO CONNECTORS

1. Reduce Maintenance Costs
2. Reduce Hardware Costs
3. Decentralize Loads in Timber Joints
4. Give Increased Strength and Rigidity
5. Easy to Install



Over 25 leading railroads are users of TECO connectors for timber trestles, guard rails, bridge decks, piers, sway bracing, coal docks, auto loading docks, warehouse roof trusses.

Write for FREE copy of TECO MANUAL OF TIMBER CONNECTOR CONSTRUCTION.

TIMBER ENGINEERING COMPANY
1337 Connecticut Ave., Washington, D. C.

FOR LOW COST BRIDGE AND TRACK MAINTENANCE

Use Mall TRADE MARK Tools

MALL Bridge and Building Machine boring 13/16" holes through three 7½" Douglas fir stringers and two 14" oak corbel blocks. ¾" bridge bolts were later tightened in place with the same unit.

MALL 5 H.P. Rail Grinder. A portable, lightweight unit for smoothing surface welds, cross grinding, switch point and frog grinding.

Our special railroad representatives will gladly assist you in recommending the type of equipment best suited for your needs. A demonstration will be arranged on your tracks without cost or obligation.

MALL TOOL COMPANY
Railroad Department
7746 South Chicago Avenue Chicago, Illinois
SALES OFFICE IN ALL PRINCIPAL CITIES

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Double-Grip Spikes Stay Tight!

Turns as it drives —and under stress acts as right hand and left hand threads— giving remarkable holding power.

Made in diameters 1/4" and larger.

PATENTS APPLIED FOR

Double-Grip Spikes cost more per unit—but *one* does the work of *three* old style spikes —and once in—they're always in . . . no loose spikes—no accidents—no wasted labor to replace or redrive.

Double-Grip Spikes hold firmly —hold indefinitely—that's why they're ideal for bridge decks, station platforms—in fact, any type of railroad timber fabrication.

Write for samples—make your own tests . . . under your own conditions . . . that's the way Double-Grip Spikes prove their superiority.

PITTSBURGH
SCREW AND BOLT CORPORATION
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Oxweld Railroad Service TOPICS

1912 — OVER A QUARTER CENTURY OF SERVICE TO AMERICAN RAILROADS — 1939

BUILD UP WORN CROSSINGS
and avoid replacement

Crossings of open hearth rail which have been worn down by traffic are restored to original surface by oxy-acetylene welding before serious batter has occurred. Oxweld MW welding rod, a specially-developed, batter-resistant rod, is used for this work. By this means, wearing surfaces of crossings can be built up again and again as wear occurs so that they can always be kept in good condition. The delay and expense of crossing replacement is thus avoided. By constantly developing and improving procedures for economical maintenance work, Oxweld helps railroads reduce operating costs.

BUILDING-UP RAIL ENDS
Lowers Maintenance Costs

Reduced wear on joint bars and ties and longer life for rail are among the factors which contribute to lowered track maintenance costs when battered rail ends are built up to original surface. In addition, rebuilding rail ends produces smooth-riding track which in turn results in more comfort for passengers, less jouncing for freight, and reduced wear and tear on rolling stock and motive power. The methods which Oxweld has developed for this repair operation make use of a special welding rod which provides a long-lasting, batter-resistant surface at low cost.

• BRIEFS •

Butt-Welded Rail—Rail butt-welded by the Oxweld Automatic Pressure-Type Rail Welding Process is being used to provide smooth-riding rail in open track; in streets and tunnels where joint maintenance is difficult; and in elevated track through stations to reduce noise.

• • •

Heat-Treating Rail Ends—With equipment especially designed by Oxweld, adjoining ends of newly laid rail are simultaneously heat-treated to provide added hardness and increased batter resistance.

• • •

Hard-Facing Shovels—It has been found that hard-facing hand shovels with Haynes Stellite alloy results in substantial economies. The hard-facing rod is

applied along the edge of the bottom side of the shovel in a band about 1 inch wide. Although the cost is only about 6 per cent of the price, the life of the shovel is increased from 2 to 3 times.

• • •

In addition to bringing to railroads the oxy-acetylene process applications described on this page, Oxweld Railroad Service provides for welding signal bonds, reclaiming joint bars, rebuilding frogs and switch points, and Unionmelt welding. When you have need for any of these operations, consult The Oxweld Railroad Service Company, Unit of Union Carbide and Carbon Corporation, Carbide and Carbon Building, Chicago and New York.

OXWELD RAILROAD SERVICE

The words "Haynes Stellite," "MW," "Oxweld," and "Unionmelt" are registered trade-marks of Units of Union Carbide and Carbon Corporation.